



# **Education and New Developments**

## **2017**

**Edited by**  
**Mafalda Carmo**

*Edited by* Mafalda Carmo, World Institute for Advanced Research and Science (WIARS), Portugal

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## FOREWORD

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This book contains a compilation of papers presented at the International Conference on Education and New Developments (END 2017), organized by the World Institute for Advanced Research and Science (W.I.A.R.S.).

Education, in our contemporary world, is a right since we are born. Every experience has a formative effect on the constitution of the human being, in the way one thinks, feels and acts. One of the most important contributions resides in what and how we learn through the improvement of educational processes, both in formal and informal settings. The International Conference seeks to provide some answers and explore the processes, actions, challenges and outcomes of learning, teaching and human development. The goal is to offer a worldwide connection between teachers, students, researchers and lecturers, from a wide range of academic fields, interested in exploring and giving their contribution in educational issues. We take pride in having been able to connect and bring together academics, scholars, practitioners and others interested in a field that is fertile in new perspectives, ideas and knowledge.

We counted on an extensive variety of contributors and presenters, which can supplement our view of the human essence and behavior, showing the impact of their different personal, academic and cultural experiences. This is, certainly, one of the reasons we have many nationalities and cultures represented, inspiring multi-disciplinary collaborative links, fomenting intellectual encounter and development.

END 2017 received 581 submissions, from 55 different countries, reviewed by a double-blind process. Submissions were prepared to take form of Oral Presentations, Posters, Virtual Presentations and Workshops. The conference accepted for presentation 176 submissions (30% acceptance rate). The conference also includes a keynote presentation from an internationally distinguished researcher, Professor Lizbeth Goodman, Chair of Creative Technology Innovation and Professor of Inclusive Design for Learning at University College Dublin; Founder/Director of SMARTlab, Director of the Inclusive Design Research Centre of Ireland, Founder of The MAGIC Multimedia and Games Innovation Centre, Ireland, to whom we express our most gratitude.

This conference addressed different categories inside the Education area and papers are expected to fit broadly into one of the named themes and sub-themes. To develop the conference program we have chosen four main broad-ranging categories, which also covers different interest areas:

- In **TEACHERS AND STUDENTS**: Teachers and Staff training and education; Educational quality and standards; *Curriculum* and Pedagogy; Vocational education and Counseling; Ubiquitous and lifelong learning; Training programs and professional guidance; Teaching and learning relationship; Student affairs (learning, experiences and diversity); Extra-curricular activities; Assessment and measurements in Education.
- In **PROJECTS AND TRENDS**: Pedagogic innovations; Challenges and transformations in Education; Technology in teaching and learning; Distance Education and eLearning; Global and sustainable developments for Education; New learning and teaching models; Multicultural and (inter)cultural communications; Inclusive and Special Education; Rural and indigenous Education; Educational projects.
- In **TEACHING AND LEARNING**: Educational foundations; Research and development methodologies; Early childhood and Primary Education; Secondary Education; Higher Education; Science and technology Education; Literacy, languages and Linguistics (TESL/TEFL); Health Education; Religious Education; Sports Education.
- In **ORGANIZATIONAL ISSUES**: Educational policy and leadership; Human Resources development; Educational environment; Business, Administration, and Management in Education; Economics in Education; Institutional accreditations and rankings; International Education and Exchange programs; Equity, social justice and social change; Ethics and values; Organizational learning and change, Corporate Education.

This book contains the results of the research and developments conducted by authors who focused on what they are passionate about: to promote growth in research methods intimately related to teaching, learning and applications in Education nowadays. It includes an extensive variety of contributors and presenters, who will extend our view in exploring and giving their contribution in educational issues, by sharing with us their different personal, academic and cultural experiences.

We would like to express thanks to all the authors and participants, the members of the academic scientific committee, and of course, to our organizing and administration team for making and putting this conference together.

Hoping to continue the collaboration in the future,

Respectfully,

Mafalda Carmo  
World Institute for Advanced Research and Science (WIARS), Portugal  
*Conference and Program Chair*

Lisbon, Portugal, 24 - 26 June, 2017

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## KEYNOTE LECTURE

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### **“ANNOUNCING THE SMARTLab VR FIRST IMPACT LABS NETWORK: CREATIVE TECHNOLOGY INNOVATION IN VIRTUAL AND AUGMENTED REALITY AND GAMES TO SUPPORT REAL WORLD COLLABORATIVE LEARNING FOR ALL”**

**Professor Lizbeth Goodman (BA, MA, MLitt, PhD)**

*Chair of Creative Technology Innovation and Professor of Inclusive Design for Learning at University College Dublin; Founder/Director of SMARTlab, Director of the Inclusive Design Research Centre of Ireland, Founder of The MAGIC Multimedia and Games Innovation Centre (Ireland)*

#### **Abstract**

Empathetic Education: Towards a Connected Learning Model applying technology supports to human development and inclusion.

This paper introduces the concepts of Empathetic Education and Hippocratic Innovation: ethical and action-oriented models to help frame the current models of education and technology development as they develop in parallel. The paper argues for a playful and creative approach to connected learning, using technology as a personalised scaffold to support each and every learner, with any level of physical and intellectual ability. Examples of Inclusive Design in learning programmes are shared, from early interactive learning using broadcast and multimedia, to kinaesthetic learning tools, games for learning, the interactive Inclusive Learning Handbook to the ILearn virtual world for collaborative learning, to the affordances of the Sensai Learning system currently in development at SMARTlab.

The talk will end with a formal announcement of the new SMARTlab VR First Impact Labs Network: a global collection of specially equipped creative technology innovation labs to support development and training in virtual and augmented reality and games to support real-world collaborative learning for all.

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#### **Biography**

Lizbeth Goodman is Full Professor of Inclusive Design for Education and Chair of Creative Technology Innovation at University College Dublin, where she directs SMARTlab and the Inclusive Design Research Centre of Ireland at UCD, and is an Executive Board member of the Innovation Academy (member institutions: Trinity College, UCD and Queen’s University, Belfast). For UCD she coordinates and manages the high level work of the pan-institutional senior faculty engaged in design and implementation of educational and pedagogic strategy in learning futures through the IDRC, and is the university representative on the all-Ireland University Project for the future of education, and on the Marie Curie ASSISTID Programme (Assistive Technology for People with Intellectual Disabilities/Autism) for the DOCTRID Research Institute: the first top tier research institute bridging the Republic and Northern Ireland. Also on behalf of UCD and the national universities network, she was elected to Chair the Social Sciences Panel of the Royal Irish Academy in 2012.

Previously, she was Director of Research for Futurelab – Lord David Puttnam’s thinktank for the future of education in the UK- and served in that capacity on the Prime Minister’s SHINE Panel. For RITSEC in Cairo, she serves as Director of the Genius Award Programme. In Ireland in 2014, she established a new Award for excellence in using technology for the sharing of knowledge across generations and levels of physical and cognitive ability: the Duais Eagnaí (Wisdom Awards) in memory of the late Daniel O’Hare. In 2008, she was awarded the top industry prizes for Best Woman in the Academic and Public Sectors, and Outstanding Woman in Technology by Blackberry Rim. Most recently, she was selected by a global panel of industry, academic and NGO experts as one of the CSR Global Top 50 Most Talented Social Innovators: awarded in Mumbai in February 2015. Back in 2003, Lifetime TV broadcast a tribute Lifetime Achievement Award for Volunteer Service to Women and Children for her work on SafetyNET,

announced by billboard in Times Square. She came third nationally in the recent Global Enterprise Awards for Ireland, for her work in setting up and running virtual campuses and virtual training centres for learners of all levels of ability around the world.

She is well known as an expert in interdisciplinary Art-Technology initiatives including STEAM education challenges globally, with a specialism in the cross-over between disciplines and community engagement on a global scale. She and her SMARTlab team have developed numerous creative educational technology tools and convergent media solutions to the challenges of teaching and learning in the 21st century, for learners of all ages and levels of ability. In this capacity, she has advised on numerous projects in the creative industries including TV/radio/convergent media education projects for children and young people. For the Open University/BBC, she researched and presented the Art Works Programme for several years and presented one of the largest arts courses, Shakespeare in Performance, (with 6,000 registered students and 6 million drop in viewers for most programmes) for which she and the OU-BBC Multimedia team won awards for their invention of new forms of interactive teaching with the Cut Your Own Shakespeare CD Roms, videos and publications. She also toured internationally for the OU and BBC in the mid-late 1990s as part of the British Council Cultural Studies course development programme for which she helped to set up the British Council-funded PhD programme at the OU, supervising some of the first international PhD candidates from Morocco through to successful completion. She also wrote and co-edited some of the OU's best selling textbooks of that period, including *Gender and Literature*, and *Shakespeare, Aphra Behn and the Canon*. While in Morocco she also set up the first technology backbone for women: a series of supported cybercafés run by women where women could communicate safely and discreetly: the beginning of what became the Safetynet charity. As part of that ongoing work, through her creative enterprise SpiritLEVEL, she also dances with women and men of limited physical movement and/or learning differences, using eyegaze and other technology supports to level the 'playing and dancing fields' for all participants so that everyone can engage fully in their own forms of creative expression.

Having developed the interactive learning rubric and characterological framework for the highly successful tv series *BB Agus Bella* in Ireland, as well as new virtual worlds to support internet safety training for parents, teachers and kids, she is currently developing new interactive inclusive children's learning programmes with collaborators from the Oscar-nominated *Song of the Sea* team and from the *Sesame Street* and *Bear in the Big Blue House* teams. This broadcasting work is informed not only by her educational experience and media and broadcast training with the BBC, but also by many years of television and convergent media work and her direction of live theatre and comedy for the *Cambridge Footlights* and *TBA Live Comedy Club* at the *Gate Theatre London* as well. This rich public speaking and production background makes her a highly sought after public speaker for academic keynotes and industry liaison events alike.

She leads a team of scholars and technologists working together to invent and implement innovative technology tools for 'real social change' via the SMARTlab International initiative, which trains PhD supervisors to support creative industry professionals in their practice-based doctoral studies in Ireland, the UK, the USA and Canada (including PhD graduates who are NASA scientists, 3D science designers, cultural heritage user interface experts, et al.). She has led numerous multi-million euro research projects for the EC and industry collaborators, and is currently co-PI for the *Learnovate Centre* (6 million euros) and *Academic Chair/UCD faculty lead* for the *ASSISTID Project* (8.9 million euros overall to the all-island consortium led by charity *Respect* for the *DOCTRID Institute*, coordinated by and for *RCSI, MSU et al*). She is also a regular judge and evaluator for many international funding councils and foundations including *SFI, the IRC, the Fulbright Commission* (for which she is currently *Chair of Judges* for the *TechImpact Awards*), the *Wellcome Trust, the Canadian Innovation Fund, SSHRC* and the *EC*. She has served as *Leonardo Advisor* for the *Science Gallery Dublin* since 2010, and previously served as *Chair of Judges* for the *Sci-Art and Science on Stage and Screen* panels of the *Wellcome Trust*. She was also *chair of Judges* for the *European Commission's HERA (Humanities in the European Research Area)* call in 2013-4, and evaluates for the *EC on SaferInternet+ and Future Emerging Tech*. She is currently collaborating with partners in the *European Parliament* on a new *Roadmap for Responsible Open Innovation – what Lizbeth calls 'Hippocratic Innovation.'*

In addition to her major contributions to the field of *Inclusive Design* through production of the *personalisable Inclusive Design Handbook* in 2014, she has also written and edited 14 books and many peer-reviewed articles and broadcasts. Having previously supervised 40 PhDs to successful completion, she currently supervises and mentors practice-based PhD and Masters dissertations and industry/research council projects in the areas of: *Creative Technology Innovation, Connected Health, Virtual Worlds, Inclusive Design, Experience Design, Interactive Exhibit Curation, Digital Media, ICT4d, Assistive Technologies for People with Disabilities and the Elderly, Technology Futures, Wearables and SMART*

Textiles, Performance Technologies, Assistive Tech, Technology Enhanced Learning for Health and Well Being, Connected Health, Personalised Electronic Health Systems, Digital Materialisation, Haptic and HCI integrated studies, as well as Gamification, or what Lizbeth calls 'Meaningful Games' or Mobile Games for Learning.

In the knowledge transfer domain, she founded the MAGIC (Multimedia and Games Innovation Centre) in East London in 2005, bringing industry and NGO players together with science scholars and artist-practitioners across disciplines in what was London's first fully open source/open access 3D printing and games lab. For seven years, she worked with Microsoft on their largest ever community engagement project- (Clubtech), which has so far transformed the education of over 7 million children and young people worldwide. She founded the charity Safetynet in 2003, and currently serves as VP for the charity Special Effect (Oxford), as well as serving on the Advisory Board of the new Samsung Innovation Centre for the Children's Health Fund and the Mailman School of Public Health at Columbia University (New York), with previous collaborations with colleagues at Columbia University working on the interactive 'smart' children's hospital at Montefiore (Bronx, NY) and the Harlem Children's Zone.

Professor Goodman and her team were selected by Crytek and VR First to lead a global learning consortium using cutting edge VR and AR tools for real social change. Partners include IBM, Microsoft, Fexco, SGI, Easylumens, 4M Group, All These Worlds, Hao2, I-DEAS, Skignz, and other smes in the science-art visualisation space. Lab spaces for outreach and community impact are currently being chosen in Dublin, Kerry, Belfast, and globally.

Professor Goodman is also co- PI on several large Canadian and US grants for Innovation in Education, with Raising the Floor and the Inclusive Design Institute of Canada, and is Visiting Prof at the IDRC of Canada at OCADU, and at the Serious Games Centre of the University of Coventry, as well as a frequent visiting lecturer at NYU. She is due to take up Visiting Professorship at Changchun University and the NVidia Joint Lab for Mixed Reality in Autumn/Winter of China in 2017.

She is a dual citizen of the USA and UK, currently resident in Ireland, with full flexible working rights in North America and across Europe and with a very strong, long-standing network of collaboration globally.

She is a woman of limited eyesight but boundless vision.

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# THE TEACHING EXCELLENCE PROJECT AS A FRAMEWORK FOR LEADING INTEGRATIVE CHANGE AND QUALITY LEARNING IN TECHNOLOGICAL AND VOCATIONAL EDUCATION

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## Abstract

Integrative change in how technological and vocational education courses in quality learning are delivered has generated better learning outcomes and ensured courses are more interactive among students as well as have improved relationships between teachers and students. The Teaching Excellence Project (TEP) framework has undergone extensive research and been used to design and develop institutional learning and teaching policies. The purpose of this case study is to describe teaching excellence in teaching quality, teaching results, ethics education, and social services as implemented at the Tainan University of Technology (TUT), Taiwan. In this study, the TEP framework within the context of higher education is revisited and examined. The importance of quality learning is addressed, and the three major elements that may foster a deep and meaningful learning inclination, to include assessment strategies, classroom milieu, and alignment of learning objectives, are discussed. The findings demonstrate that success in teaching excellence involves creating a sustainable future that is realized by raising the quality of the education, research, and development that supports the vision of collegial governance and academic freedom.

**Keywords:** *Teaching excellence, change processes, quality learning.*

## 1. Introduction

The Teaching Excellence Project (TEP) framework, developed by Shephard, Harland, Stein, and Tidswell (2011), is a triadic schema that includes assessment strategies, classroom milieu, and alignment of learning objectives. The schema has been used to develop institutional learning and teaching policies. Evolution of the model over the last decade has resulted in the emergence of higher education models of quality based on the education acts of law in various countries and students' learning that have influenced educational organizations (Dobre, 2015). However, researchers in the field still argue that the development of the TEP, namely, assessment strategies, classroom milieu, and alignment of learning objectives, has not been tested over time and that the schema is still a loosely coupled structure (Owens & Strahan, 2016).

The purpose of the study was to understand the learning process from the point of view of both students and faculty with respect to the award processes' criteria for the TEP model, namely, supporting learners, leadership in teaching, and personal development. The TEP model of teaching awards for Australia (Awards for Teaching Excellence), England and Northern Ireland (National Teaching Fellowship Scheme), Malaysia (*Anugerah Pengajaran* [Teaching Awards]) and New Zealand (Tertiary Teaching Excellence Awards) have much in common in so much as they are used to support learners, leadership in teaching, and the personal development of both students and educators. Implementation of the model is expected to encourage greater engagement in "the scholarship of learning and teaching" by the caucus of university teachers (Shephard et al., 2011, p. 47).

While Carusetta (2001) noted an emphasis on teaching excellence in higher education, Skelton (2004, 2005, 2009) referred to interpreting the award process as evaluation at an institutional level between engaging in the scholarship of teaching and learning (resulting, for example, in teaching awards) and improvements in the student experience (Brew & Ginns, 2008), at least in Australia. It is critical that learning and teaching in higher education include the culture of modern higher education with the personal change or development of individuals' contributions and experiences. Within the last decade, higher education institutions have been operating in an environment of increased competitiveness and change. Successful higher education institutions are those that can change effectively, either through

creating new tools or meeting new goals for existing individual higher education institutions. Most higher education practitioners, however, think in terms of exploring teaching excellence or limiting it rather than focusing on the nature of influence and change. According to Kezar (2001), true educational change occurs when institutional learning and teaching policies change.

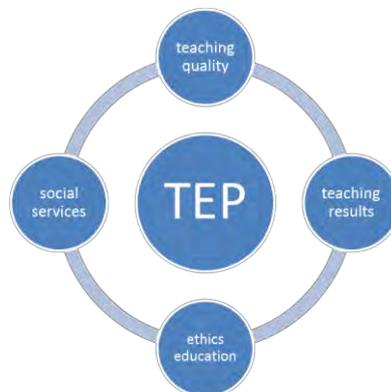
Technological expertise and some of the associated guesswork and anxiety have quickly pushed Taiwan into the global arena (Korka, 2011). As leaders of educational institutions encounter an array of new questions and challenges, the leaders of the Tainan University of Technology (TUT) sometimes wonder what their efforts to prepare and adapt to change will bring. In order to create something of value, it is necessary to have appropriate institutional policy and management and to use policy and management creatively and with imagination to implement teaching awards with a range of rationales. The TEP framework for evaluation constitutes the approach teachers of the TUT are taking with respect to educational change processes.

In this study of vocational education, the integration challenges faced by the TUT faculties and students will be described and an overview of the TUT's vocational education and factors or experiences of its development as well as the solutions used to stimulate excellence for integrative mechanisms and initiatives. Thereafter, the process implemented at the TUT for influencing change in vocational education will be described. Finally, the components (teaching quality, teaching results, ethics education, and social services) that comprise the TUT's vocational education and factors or development experiences will be outlined.

## 2. Conceptualizing the TEP Process

The TEP framework, arising from the work of Shephard et al. (2011), includes teaching quality, teaching results, ethics education, and social services and consists of expanding concentric circles. Each circle represents a stage in the process of an organization moving from the status quo to a context characterized by enthusiasm and willingness to commit to change (see Figure 1). Vocational education institutions offer education for specialties in the workplace (Lankard, 1996). Shephard et al. (2011) discussed how successful teachers conceptualize their teaching roles (see, for example, Kreber, 2000, in Canada) and described excellent teaching from an 'expert' perspective (see, for example, Dunkin & Precians, 1992, in Australia).

Figure 1. The TEP framework.



The TEP (Shephard et al., 2011) includes three stages in the learning process. The first stage involves *building support*, which is achieved through assembling a core group of people who will spread the message. The second stage is *individual commitment*, which is facilitated by personal growth, learning, and personal results. The final stage is *organizational results* where the collective mindset is changed and new organizational processes and systems put in place to produce lasting change for the organization.

It has become increasingly apparent that the integration academic and vocational programs has had a substantial impact on students' learning processes (Lankard, 1996) and learning styles. Therefore, it is essential that the learning process be differentiated. In this regard, the TUT reviewed Shephard et al.'s (2011) TEP framework in order to identify three learning processes to support students in their learning, namely, passionate champions, appropriate learning contexts, and interfacing issues. How the TEP framework was implemented is described in the section that follows.

### 3. The TEP Framework: Implementation Trends

According to the three-year learning plan of the TUT's TEP, it was deemed necessary and initiated to institute a Teaching Excellence Center. The Teaching Excellence Center, established in 2001, has the goals of demonstrating students' potential and giving recognition to faculty and students for the comprehensive and practical nature of curriculum in the vocational education system. Student learning is the goal of the Center. The Center is open to all fulltime faculty who teach at the TUT. An ongoing evaluation plan was designed.

To understand some of the reasons for the creation of the Teaching Excellence Center and its broad legislative mandate, it is useful to recall that from 1990, the Ministry of Education (MOE) of Taiwan carried out several projects (NAFSA's 52nd Annual Conference, 2000):

1. A "University Law Amending Group" was established to check the problems resulting from the implementation of the University Law and hold public hearings in various regions to gather different opinions.

2. The present structure of the Academic Examination Committee of the MOE is in an ongoing process of being adjusted by a higher education examination committee.

3. The internal funding system of national universities and the Teacher Resource Project have been promoted to create flexibility in personnel and financial operations in order to extend the effect of resource manipulation and seek improvement in educational quality.

4. The MOE has been trying to seek a balance of resources between public and private schools, assist the full development of private universities, supervise the development project of general affairs of private universities and colleges, and give awards and sponsorship according to the universities' performances.

5. Universities have been encouraged to promote an evaluation system for teachers, evaluate basic subjects within the school, and trust professional institutes to carry out the evaluation.

6. A Pursuing Academic Excellence Developing Project of Universities has been initiated to enhance academic levels and develop the individual characteristics of each university.

Based on the developments and principles outlined above, the role of the Teaching Excellence Center was identified as that of promoting impeccable, diversified vocational education while maintaining appropriate social control. The Center was created to foster teaching and learning of the highest quality at the TUT. Vocational training systems are based on both the study and career needs of student in the industry and schools and include the spirit of being practical and useful, as suggested by the Ministry of Education, Taiwan (2013). Whether knowledge-based innovations and research can be advanced further hinges on events in higher education. Higher education is already a primary arena for competition among many countries with regard to knowledge creation and human resource development. Not only does higher education play a decisive role in national development, but also, higher education is a vital source from which enhancements in national competitiveness spring.

In 2005, an overall assessment of university administration was conducted; a plan was launched to reward universities for teaching excellence with the expectation that universities would be encouraged to emphasize teaching and enhance the quality of university education through performance-based incentives" (Ministry of Education, Taiwan, 2006, p. 49). The "explosion" of knowledge, the increase of state mandates related to a myriad of issues, fragmented teaching schedules, concerns about curriculum relevancy, and a lack of connections and relationships among disciplines have been cited as reasons for a move towards an integrated curriculum (Jacobs, 1989).

From the TUT's exploration of cooperative learning structures and processes, faculty and students recognized the existence of learning sequences. Moreover, the fast-changing social landscape, political liberalization and democratization, rapid economic growth, industrial restructuring, and increasingly pluralistic social values over the last few years have brought new challenges for higher education in terms of its traditional functions and stewardship role. Staff at the Center must constantly view the Center as a value platform to help guide the TUT's development. The following identifies those changes in education most likely to affect the TEC's ability to achieve its two goals: (a) Publicly recognize faculty members for their dedication, creativity, honed insights, and skills; and (b) contribute to the realization of a high-quality learning environment for TUT students.

With respect to achieving Goal 1, the Spotlight on Teachers is a collection of profiles that offer insight into what individual faculty members think about teaching and how to best facilitate student learning. With the help from faculty and staff, a collective portrait can be built of how the TUT faculties pursue teaching excellence on campus through a wide variety of philosophies and approaches. With respect to achieving Goal 2, in January 2006, the Faculty Federation was established to honor outstanding teachers amongst the TUT faculties with a Teacher of the Year award. In these profiles, the Teacher of the Year reflects on what being a teacher means to him or her and how, over his or her career, he or she

has come to facilitate the learning of his or her students effectively. The TUT proposed a Teaching Excellence Plan in 2012, suggesting the implementation of the TEP framework would create excitement about teaching by helping leaders of the TUT look forward and allowing students to take control of their own learning.

In the future, several key external factors in the Center's environment will need to be addressed. Due to the rapid change of many sectors of education, it is critical the TEC's implementation process be a dynamic one. The Center involves (a) supporting faculty efforts to improve teaching by creating learning environments in which the TUT's diverse student body achieves maximal learning potential, and (b) promoting a culture throughout the university that values and rewards effective teaching and respects and supports individual differences among learners.

#### 4. Conclusion

In education, the learning process should be viewed as involving technology infrastructure, administrative support, teacher training, collaborative curriculum planning, creative funding, administrative support, redefined roles, and parent/community involvement. In this paper, a narrative case study analysis was used to describe the implementation of the TEP framework for integrative change by TUT. The framework seems to be better suited to an all-win program for schools, students, and enterprises (Golish, Besterfield-Sacre, & Shuman, 2008; Ministry of Education, 2013). The rationale was based on Bingham and Davis's (2012) assertion that educational policy and practice should be integrated with a comprehensive change process that addresses what the product is or should be, what the process should entail, and what people should learn. In the TEP framework, technology infrastructure, administrative support, teacher training, redefined roles, collaborative curriculum planning, parent/community involvement, and creative funding are the seven components for supporting and regulating learning processes.

It is critical that leaders create business strategies that add to their organizations' future viability and the well-being of people and communities (Anderson & Anderson, 2001, p. 203). In order to face the challenges that accompany change, Taiwan's Ministry of Education (2013) is actively working to establish an educational foundation to support the concept of a "knowledge-based economy" (p. 1). In 2013, a sub-project entitled the Promotion of the Innovative Education Industry was implemented. Ultimately, continued engagement with the learning process of teaching and the learning process in vocational education and training will serve to enrich the learning and teaching experience for all those in educational programs.

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## TEACHING STRATEGIES OF DICTATION IN MUSIC EDUCATION

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### Abstract

Dictation which forms the foundation of solfege training is a synthesized product of musical memory, ear training, notation, rhythmic writing and capability of perception. In the field of music education, dictations are the most highlighting feature when it attempts to measure the individuals' ability of music. Therefore, their role in ear training is undoubtedly important. Students having problems with musical dictation generally need to practise and study with their teachers. Therefore, most of the time students remain dependent on their teachers in their dictation studies.

In this study, nine teaching strategies have been developed and suggested for students of music education to study dictation individually, Interval studies; tonality studies; rhythmic studies; rhythmic dictations; mono voice melodic dictations; dictations written with mistakes; melodic dictations supported with rhythm; two voice dictations at medium difficulty level, played on different instruments; filling in the scales in polyphonic dictations played with different instruments.

In this study, practical ways of dictation techniques, methods and teaching strategies have been proposed to students, which will help them study individually. At the same time, these applications are aimed to improve students' musical memories, notation, rhythm skills, and knowledge of instruments. In these practices which are done with the support of CD recordings, dictations are not only played on a piano, but different kinds of instruments both from western music and traditional Turkish music are .

**Keywords:** *Teaching strategies, Dictation training, Musical memory.*

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### 1. Introduction

Courses in music education programmes in Turkey, namely, Ear Training, Musical Writing and Reading (in Faculties of Education) and Solfege, Music Theory, and Dictation (in Faculties of Fine Arts and Conservatories) are examined in three main dimensions.

1. Solfege or Musical Reading (Ear Training can be also added into this dimension) attaches importance to intonation and other similar technical features by appropriately performing pitch and duration values.

2. Theory or Musical Writing supports students by shedding light into theoretical courses such as harmony, counterpoint, music forms and so on, and individual instrument training through basic education of music knowledge.

3. Dictation or Musical Writing is concerned with determining the tonalities and scale degrees of melodies and finding out the appropriate pitch of their notes and putting them into notes, and determining the rhythmic patterns or duration values properly, and putting the theoretical knowledge into practice at this stage. Thus, dictations that form the basis of solfege training are a synthesis of musical memory, hearing, notation, and rhythm writing and perception skills.

This study introduces dictation teaching strategies employed in the book entitled "Dictation Studies: Dictations inspired by rhythmic, tonal, modal and jazz music supported by audio-CD" (Educational Publications Konya - 2015), which serves for the aims mentioned above. This book is designed to enhance students' musical memories, note and rhythm skills, enrich their knowledge of instruments, and assist them with their individual dictation studies at the same time.

The CD recordings in the book consist of rhythmic and melodic dictations which have been written and composed through being inspired by a wide range of melodies of tonal, modal and jazz music. Dictations have not only been played on a piano but tonal parts are also played on western music instruments and modal parts on Turkish musical instruments. The book also includes rhythmic and melodic preparatory training and some exercises to find intervals and tonality apart from the dictations.

Dictations are the most important factor in assessing talent in individuals who are studying music. Therefore, their role in ear training is undoubtedly important. The problem of dictation is usually solved through cooperation between the teacher and the student, getting cooperatively engaged in relevant exercises and training. Hence, the student often depends on the teacher in the work of dictation and in dictation exercises. Moreover, unfortunately dictations presented in music education are only played and written on the piano without using other various instruments. However, it is important to shed light on the future art work of music students without restricting their hearing skills to a single instrument, and by enriching their musical memories by means of orchestra and, especially, Turkish music instruments.

Thus, the aim of the current study is to seek answers to the questions below.

1. How should it be benefitted from the book titled "Dictation Studies: Dictations inspired by rhythmic, tonal, modal and jazz music supported by audio- CD" in order to assist students with their individual studies on dictation?

2. How can the book be used to get dictation away from the dominance of the piano as the sole instrument in music education, and rather, influence dictation with other western and Turkish musical instruments?

All this discussion is presented in nine main sections in the book.

## 2. Method

This paper is a compilation work set out along with dictation studies from music education systems of various cultures, and teaching experiences accumulated through lessons. Appropriate exercises are compiled and composed in accordance with the findings obtained from French, Russian and Turkish music education methods.

## 3. Findings and Discussion

In order for the students to be able to do independent dictation exercises and to improve their ability to hear these dictations with Turkish music instruments, nine different teaching strategies have been developed in the book: Interval studies; tonality studies; rhythmic studies; rhythmic dictations; mono voice melodic dictations; dictations written with mistakes; melodic dictations supported with rhythm; two voice dictations at medium difficulty level, played on different instruments; filling in the scales in polyphonic dictations played with different instruments.

### 1. Interval Studies

Hearing interval is the first step in dictation writing. In both mono-voice dictation (horizontal interval hearing) and in two-voice and polyphonic dictations (vertical interval hearing), intervals are undoubtedly important. Hence, it is best to start with intervals at the preparation stage of dictation work.

The interval exercises given in this section are harmonically played on the CD (that's, both sounds of the intervals are heard together). The harmonic intervals vocalized in the recordings can be studied by students on their own, and they can also be worked out melodically on a piano by the help of the teacher during the lesson.

What is expected from the students in this section is to try to find out the interval played through the CD (simple and compound). Each interval is repeated twice in the recordings. It is enough just to place their names in the scale without paying attention to the pitch of the intervals. Then these exercises should be checked by using the answer key.

### 2. Tonality Studies

Finding a vocalized tonic tone is related to the interval hearing. It is usually determined by considering the dictation played after the note "la" and its direction in tonality, and the distance between the stopper and "la". In line with this, the step in dictation writing, following the interval studies, should be to find tonality.

Tonality studies are not only for finding out the tone, but also for determining its type (natural, harmonic, melodic). Therefore, the modes of the tonalities (especially the minor) should be taken into account more.

In this section, two measured conclusive cadences and tonic chords are played after the note "la" by the help of the CD recordings. What is expected from the students is to find out which tonalities these cadences and tonics, which are vocalized after the "la" note, belong to (with the interval study). Since the number of measures is not important in these studies, unit beat is not given. Further exercises after this step should be checked out from the answer key. The efforts to find tonality are given up to 5 sharps and 5 flats. These tonalities have not been taken into account since they appear to be harmonious in subsequent tonalities (e.g. Si Major-Do b major etc.).

### 3. Rhythmic Studies

Melody and rhythm are the fundamental elements of dictation studies. In other words, the rhythmical form is as important as the melody. The students do not only face with the matter of rhythm for dictation but also for the time of deciphering. The best way to solve this problem is ensured by dictations since it is not difficult for a student, who is able to perceive and write a rhythmic pattern accurately, to manage the time of deciphering.

Rhythmic patterns can be grasped by the student more easily by separating them into clusters in the first stage. Moreover, it is more convenient for the students to deal with rhythmic patterns without any melodies so that the students can overcome it.

The expectation from this section, which forms the preparation stage of rhythmic dictation, is that rhythmic clusters with two measures are moved to notation considering the pitch. This section, which is included in the CD recordings, is performed on the piano. In the recording, the unit is given first (2 measures). Then the two measured rhythmic patterns are played with three repetitions. The numbers of the rhythmic clusters are listed as simple, compound and irregular (aksak). Rhythmic patterns are becoming increasingly more difficult with the support of the extension ties, starting at medium difficulty levels.

### 4. Rhythmic Dictations

After studying the two measured rhythmic clusters in the third section, the rhythmic dictations in the 4th section set a more difficult stage. However, the progressive work in the third section set the basis for this section as the vocalization of the dictations has been presented two-measured in the CD recordings.

The most important feature of rhythmic dictations is that they are performed without melody and thus more focused on the rhythm itself. As it has already been mentioned, this both helps the students with the dictation and contributes to their interpretation of the instrumental and solfege deciphering.

In this section, rhythmic dictations are presented in simple, compound and irregular (aksak) dimensions. The rhythmic dictations are sequenced from simple to complex. In the CD recordings, the beats are given first (2 measures), corresponding to the number of rhythmic striking measures.

In these rhythmic dictations, consisting of a total of 28 parts, there are rhythmic difficulties such as syncoplasma, trimesters, extension ties, extension points, and so on.

### 5. Mono-voice Melodic Dictations

This section consists of 50 tonal pieces. Dictations are played on a piano in the CD recordings. In this section, the information regarding interval, tonality and rhythm presented in the previous sections should be used. The following points must be taken into account while turning dictations from the recordings into notes:

1. After the La-note is given in the recordings, the dictation is played from beginning to end, and after the note La, the dictation tonality is determined (exercises for finding interval and tonality).

2. The unit beat of the dictation is hit according to the number of measures (2 measures), and after this, the number of measures is determined (rhythmic studies).

3. The two measures are repeated twice, and then, in the third repetition, it is connected to the other two measures.

4. Finally, the dictation is played again from beginning to end in order to revise and make the final corrections.

For melodic dictation, the following are necessary to do:

1. Generally melodic dictations are written in a period formed as a question-answer, which is the simplest form of music. For this reason, it often consists of 8 measures.

2. The sounds that begin a dictation often constitute one of the first three sounds of the tonic chord (degrees 1, 3, and 5).

3. Depending on the period form, the fourth measure is formed on one of the three sounds of the dominant chord (usually fifth degree).

4. The end note is always complemented by the tonic chord function. Thus, it is useful to write the last two measurements based on logical analysis.

It is worthy to note that all these ideas proposed here just offer general guidelines. It does not necessarily mean that all dictations must be written strictly depending on these rules as music relies on creativity and free thinking cannot be limited to such rules.

But the main points of the instructional dictations are outlined above.

Some dictations also have Fa- clef, which constitutes the preparation phase for two-voice dictation in the following sections.

5. Dictation written with mistakes

This section is one of the dictation training methods. This method teaches students to listen to music as a melodic and rhythmic whole, by enhancing their levels of attention. Since the dictations in this section are mono-voiced, students do not have concentration problems during their work.

The correct versions of dictations are included both in the answer key of this section and in the CD recordings. By listening to the dictations from the recordings, ones with either melodic or rhythmic errors should be corrected. The CD recordings have been prepared in the same way as in the "Mono-Voice Melodic Dictations" section and played on the piano. The pieces in this section are mono-voiced and they include 5 sharp and 5 flat tonalities. After the mistakes are corrected, they must be checked out from the Answer Key.

#### 6. Melodic dictation supported with rhythm

These dictations form the basis of the preparation for two-voice melodic dictations. At the same time, the rhythmic dictation is a good example of polyrhythmic (multi-voiced rhythm) exercises combined with the rhythmic structure of the melodic line. Therefore, these dictations are evaluated in two ways:

- a. Two-voice dictation
- b. Polyrhythmic dictation.

Dictations have piano and percussion instruments in their CD recordings. Apart from the tonal dictations, modal dictations are also available in this section. The note of the melodic part is given as the Fa-clef in some pieces.

#### 7. Two-Voice Dictation played with different instruments at medium difficulty level

This section includes dictations which are inspired by tonal, modal and jazz music. The dictations have not been performed only on the piano but also with different instruments. In the CD recordings, tonal dictations have included western music instruments, while modal dictations have included Turkish musical instruments. Modal dictations are expected to be developed within the concept of tonality, despite their unique features and characteristic colour tones. For this reason, the determination of tonalities in modal dictations should be made considering the sound "la". The dictations are presented in simple and compound measure numbers.

#### 8. Filling in the blank measures in the polyphonic dictations played with different instruments

This section is presented to the students in a partially written form because the dictations are of a higher level of difficulty. There are various instruments in the voice recordings as in the previous section. Dictations composed of tonal and jazz music intonations are given in two and three voices. Measures or motifs that are left blank after listening to the dictated recordings must be transferred to the note in a melodic and rhythmically correct manner. The CD recordings of these dictations are performed in the same way as they are in the other sections, not in the form of two-measured repetitions, but in separate sentences to provide musical integrity. Some small dictations are even repetitive from beginning to end. Dictations should be checked out from the Answer Key.

## 4. Conclusion

The student who follows these methodical approaches in the book can develop dictation writing skills individually. At the same time, this book is a resource that incorporates strategies of teaching dictation which improve the musical memories of the students, their note and rhythm skills, and their knowledge of musical instruments with different methods and techniques.

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# INTERNATIONALIZATION OF TEACHING IN HIGHER EDUCATION: CASE OF TURKISH UNIVERSITIES AND ACADEMICS

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## Abstract

The study analyzes the staff mobility of Turkish instructors in Erasmus+ teaching assignments. 45 in-depth interviews are conducted with academics teaching in various fields in different Turkish state and foundation universities. The aim of the study is to show the differences and similarities between teaching in a Turkish university and teaching in a European university, and the impact of this mobility on teaching staff, as well as the internationalization of higher education. The questions that are asked in the in-depth interviews are grouped under the following topics; a) reasons for and expectations from teaching in another university in Europe, b) topics preferred to be taught, c) the comparison of student reactions to lectures and/or seminars, d) contribution of the staff teaching assignment experience to the academics professionally, e) overall assessment of the staff teaching assignment mobility. The overall assessment of Erasmus+ teaching assignment mobility indicates that although it is a short initial contact, it can lead to concrete outcomes such as long-term collaborations and cooperation between universities and/or academics and/or students. Moreover, the findings of the research show that it provides an international environment where academics can assess their teaching, see their strong and weak points and develop themselves accordingly.

**Keywords:** *Internationalization, Higher Education, Erasmus+ Mobility, Teaching.*

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## 1. Introduction

Staff mobility for teaching within the Erasmus Mobility Program was first introduced in 1997 and since then it has become more and more popular each year. It was the Lifelong Learning Program created in 2007 which included the staff training program<sup>1</sup>. By the academic year 2013-14 there were more than 4900 higher education institutions (HEIs) holding the Erasmus University Charter that provided staff mobility<sup>2</sup>. The aim of the mobility is to enrich the international teaching experience of participating staff, to contribute to the internationalization and modernization of higher education through cooperation and collaboration among higher education institutions and staff, as well as to encourage student mobility for specific reasons such as developing a supra-national European identity, educating more competitive and more employable individuals in the global market.

In addition to these basic aims, European Commission in its 2015 Erasmus+ Programme Annual Report renews and emphasizes the role of education and training for promoting shared values, intercultural understanding and social inclusion.<sup>3</sup> In response to these key challenges the Joint Report<sup>2</sup> of the Council and the Commission on the implementation of the Framework for European Cooperation in education and training (ET 2020) identifies a number of priority areas for European cooperation in education and training: a) improving people's skills and employment prospects, b) creating open, innovative and digital learning environments, c) providing support for teachers and trainers, d) cultivating the fundamental values of equality, non-discrimination, active citizenship, and transparency, e) recognition of skills, sustainable investment, and quality, and f) the efficiency of education and training systems<sup>4</sup> all of which increase the importance and the role of Erasmus+ Programme and the mobility it provides.

According to the data provided by the Directorate-General for Education and Culture, the staff mobility budget accounts for about 7 % of the overall Erasmus budget. There is, approximately, a 14 %

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<sup>1</sup>European Commission, Directorate-General for Education and Culture. *Erasmus Facts, Figures & Trends 2012-2013*. Brussels.

<sup>2</sup>European Commission, *Erasmus+ Programme Annual Report 2015*. Brussels.

<sup>3</sup>*Ibid.*

<sup>4</sup>European Commission. *Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions*. 2015. Brussels.

year-on-year increase in staff mobility each year. The average duration of a staff mobility period (including teaching assignments and staff training) was 5.7 days and the average grant was € 725 per staff exchange until 2012-13 academic year.<sup>5</sup> However, since then the teaching hours have been increased from a minimum of 5 hours to 8 hours.

In this context, as an EU candidate country, Turkey first became a non-EU Programme country in 2004. It has been one of the most successful educational exchange programs in the country and since 2012-2013 academic year, Turkey, among all the member and non-member programme countries, has been one of the five countries that sent the highest number of staff abroad together with Poland, Spain Germany and France in the order of Poland, Spain, Turkey, Germany and France.<sup>6</sup> On the other hand, the five most popular destinations that are preferred by both academic and administrative staff are Spain, Germany, Italy, France and the United Kingdom,<sup>7</sup> Spain being the most popular destination not only in staff but also in student mobility.

At present, in staff mobility for teaching assignments, staff from higher education institutions and enterprises go and teach a period of a minimum of two days and at least 8 teaching hours. The maximum duration of teaching at a higher education institution in another participating country is six weeks. On average, instructors teach 8.3 hours abroad per teaching assignment, which has an average duration of 5.6 days.<sup>8</sup> Since 1997, due to the interest in the program, the number of teaching assignments has grown constantly. For example, compared to 2014, the interest for the KA1 actions increased by 11% in 2015.<sup>9</sup> According to the Erasmus+ Annual Programme 2015 published by the European Commission in 2017, 99% of staff is satisfied with their experience in general.<sup>10</sup> And according to the statistics published by the Turkish National Agency, the percentage of teaching assignments makes up 16.44 % of the total Erasmus higher education mobility in Turkey.<sup>11</sup>

## 2. Objectives and Method

Within this framework, staff mobility of Turkish instructors working in teaching assignments are analyzed and 45 in-depth interviews are conducted with academics teaching in various fields in different Turkish state and foundation universities. The aim of the study is to show the differences and similarities between teaching in a Turkish university and teaching in a European university, and the impact of this mobility on teaching staff, as well as the internationalization of higher education. Four of the universities that the interviewed instructors work for are in Istanbul and two of them are in north-west Anatolia.

The questions that are asked in the in-depth interviews are grouped under the following five topics; a) reasons for and expectations from teaching in another university in Europe, b) topics preferred to be taught, c) the comparison of student reactions to lectures and/or seminars, d) contribution of the staff teaching assignment experience to the academics professionally, e) overall assessment of the staff teaching assignment mobility. All questions that are asked are open-ended questions which allow and enable the interviewees to express their opinions in detail without any limitations.

## 3. Discussion and Findings of the in-depth interviews

### 3.1. Reasons for and expectations from teaching in a European university

The reasons for visiting and teaching in a European university vary from one academician to the other in details, however, in general terms they can still be classified as;

- To broaden international teaching experience
- To share experiences and knowledge with colleagues in different European universities
- To transfer information to the students of the host university about the developments in the related field in Turkey
- To observe how academic studies and researches are carried out in European universities
- To understand the academic context of European exchange programs
- To see European universities' collaboration and cooperation with industry and national and international markets.
- To work with Turkish graduate or PhD students in the host university which is visited

<sup>5</sup>European Commission, Directorate-General for Education and Culture. *Erasmus Facts, Figures & Trends 2012-2013*. Brussels.

<sup>6</sup>Ulusal Ajans, Erasmus+ Programı. *Personel Hareketliliği*.

<sup>7</sup>European Commission, Directorate-General for Education and Culture. *Erasmus Facts, Figures & Trends 2012-2013*. Brussels.

<sup>8</sup>*Ibid.*

<sup>9</sup>European Commission, *Erasmus+ Programme Annual Report 2015*. Brussels.

<sup>10</sup>*Ibid.*

<sup>11</sup>Ulusal Ajans, Erasmus+ Programı. *Personel Hareketliliği*.

#### Some sample answers

A language instructor at a state university, “Since this is only my third year in ELT at a university, I wanted to understand the context of European exchange programs and have a first-hand experience. I also wanted to see the international environment which helps students to learn English more easily and in a shorter time”.

A language instructor at a foundation university, “Our university provides us this opportunity to enhance our knowledge of profession and experience. I wanted to utilize this opportunity”.

A math professor at a foundation university, “I had two PhD students at that French university in which I also have colleagues. I visited that university to help with the studies of my students and share information with my French colleagues, and also inquire possibilities of new collaborations”.

A finance assistant professor at a foundation university, “I did not have any international teaching experience. Actually, I did not have a very long teaching experience in general because I had just become an assistant professor and started teaching a year ago. That’s why I wanted to visit a European university and improve my teaching skills by teaching international students”.

### 3.2. Topics preferred to be taught

In teaching assignment mobility, instructors are sometimes free to choose the topics that they want to teach but sometimes they are asked to teach certain topics according to the needs and interests of the students and the syllabus of the course in the host university. Moreover, in certain fields such as International Relations or Language and Literature, students of the host university mostly want to learn about the politics or literature of the visiting instructors’ native country. When instructors are free to decide on the topics that they are going to teach, they choose the topics according to the following criteria;

- Courses offered in the host university
- Experiments carried out in the host university
- Popularity of the topic world-wide
- Requests of the students/instructors in the host university
- Their own research topic

Or they choose topics which

- may enable students to make comparisons in the related field

• can eliminate the barriers between the students and the instructors and create a more relax and friendly learning environment.

Some sample answers

A language instructor at a state university, “I especially chose topics that would lift the barriers between the students and me so that it could be an enjoyable class. I wanted it to be fun”.

An associate professor in the Mechanical Engineering Department at a foundation university, “I chose that particular topic because it was one of the most popular topics in mechanical engineering that year”.

A professor in the Business Administration Department at a state university, “It was the request of both the students and the professor of the course”.

An assistant professor in the International Relations Department at a foundation university, “I gave a lecture on that topic both because the students wanted to have some information about it and also because I wanted them to be able to make realistic comparisons between countries/nation-states”.

### 3.3. Comparisons of student reactions to the lectures and seminars

The answers in the interviews indicate that, in terms of student reactions, there are more differences than similarities. The differences are:

- A higher number of students read the assigned texts
- They prepare for the class more
- They are more responsive
- Their level of English is better
- They participate in class more and this makes classes more interactive
- In some universities, students applaud the instructor at the end of the class or hit on the desks

to show their appreciation which very rarely happens in Turkish universities

The similarities are:

- Both Turkish and European students are cooperative
- Both Turkish and European students like group-work

Some sample answers

An assistant professor in the Economy Department at a foundation university, “They express themselves freely and easily”.

An associate professor in the English Language and Literature Department at a foundation university, “They show their appreciation by hitting on the desks. First, I was shocked. I thought they were protesting me”.

A language instructor at a state university, “They like group-work and they are good at it just like my students”.

An assistant professor in the English Language and Literature Department at a foundation university, “I am impressed by the way they prepare for class. Most of them come to class having read all the texts that are assigned”.

### 3.4. Overall contribution of teaching assignment mobility to the academics

For the contribution of Erasmus teaching assignment mobility, all the instructors state that it is very beneficial in all terms and they would like to go and teach at another European university again. The areas where this mobility is beneficial for the academics are;

- interaction with academics in the same field but in different countries who continue their studies under different conditions
  - sharing ideas with colleagues about a common field of study
  - learning about the recent developments in that field in the country visited
  - getting immediate and concrete reactions to the given lectures and/or seminars both from students and colleagues
    - sharing first-hand experiences and knowledge
    - starting new projects and cooperation
    - developing international teaching skills
    - enhancing cultural repertoire

## 4. Conclusion

In sum, the overall assessment of Erasmus+ teaching assignment mobility indicates that although it is a short initial contact, it can lead to concrete outcomes such as long-term collaborations and cooperation between universities and/or academics and/or students. Moreover, it provides an international environment where academics can assess their teaching, see their strong and weak points and develop themselves accordingly which is especially important for young academics.

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## **WHAT IF OUR SCHOOLS ARE WORKING? BASE, SUPERSTRUCTURE, AND HEGEMONY IN GLOBAL EDUCATION REFORM**

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### **Abstract**

UNESCO initially identified six internationally agreed education goals to meet the learning needs of all children, youth and adults by 2015. When these goals were not met, the 2015 World Education Forum identified a new set of goals to be achieved by 2030 promising “inclusive and equitable quality education and lifelong learning for all.” This paper explores the role of education in advanced capitalist nations, especially the United States, and in Third World developing nations. In both tiers education performs the institutional goal of sorting people out into socially stratified class roles and imposes a hegemonic belief that the system is fundamentally fair and that those who fail, fail because of their own short-comings. As case studies it examines corporatist reform movements spear-headed by companies like Pearson Education and hedge-fund dominated foundations that use high-stakes standardized testing and charter schools in the United States a campaign to force market economics and for-profit strategies in education while dismantling schools as public institutions. This phenomenon has been a major force undermining the idea of the public sphere in the United States. It has also been used to exploit Third World countries where for-profit edu-businesses that supposedly will train people for employment in low-level technical jobs serving the global economy are being presented as alternatives to poorly funded public institutions. Last, the paper explores the dialectical possibility of the emergence of Gramscian oppositional working-class organic intellectuals in the struggle for public education, a possibility that can have broader implications in the struggle for progressive change.

**Keywords:** *Reform, Schools, UNESCO, Pearson, Education.*

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## **NOT SO FAST: A CASE AGAINST LEAVING LIBERAL ARTS BEHIND IN THE RUSH TO STEM EDUCATION**

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### **Abstract**

Studies indicate that engineers spend between 40-70% of their day on writing tasks, mostly correspondence (Cunningham & Stewart, 2012). A recent study conducted in Qatar revealed that Texas A&M University at Qatar (TAMUQ) alumni engineers, who are mostly in early career, on average spend 31.5% of their working day (2.5 hours) on writing tasks. However, at many universities worldwide, and at TAMUQ, students often have few opportunities for experiential learning of everyday workplace communication and other soft skills, even as Science Technology Engineering and Math (STEM) has become the recent buzzword in educational reform recently (U.S. Department of Education, n.d.).

In fact, the World Economic Forum (WEF) notes that “Overall, social skills—such as persuasion, emotional intelligence and teaching others—will be in higher demand across industries than narrow technical skills” (World Economic Forum, 2016). Among more STEM-related skills such as ICT literacy and mathematical reasoning, WEF also cited active learning, creativity and active listening and critical thinking as vital in the new workplace (Ibid.). Top-tier engineering programs in the US are now acknowledging that engineering education should incorporate such skills (Stanford, 2015).

This paper provides a case study of an English faculty member who is attempting to leverage their experience in their previous career in technical writing to argue the roles and value of teaching the liberal arts in an engineering program. Challenges in course and assignment design, assessment, as well as student and institutional expectations, are detailed, with student feedback also given.)

**Keywords:** *Pedagogy, inductive learning, liberal arts, STEM education.*

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## **1. Introduction**

### **1.1. STEM Education and Liberal Arts**

Recently, STEM education has received much emphasis and funding within the United States (White House, n.d., U.S. Department of Education, n.d.).

However, the Association of American Colleges & Universities (AAC&U) has several initiatives dedicated to empowering STEM faculty, including those from underrepresented groups, to graduate more students in STEM fields who are competitively trained and *liberally educated* (Association of American Colleges & Universities, n.d.) Their Liberal Education and the American Promise initiative is based on extensive use of employer research which shows that employers, in large part, prefer employees who balance core subject area knowledge such as math and sciences with “applied skills” (Association of American Colleges & Universities, n.d.)

In addition, for some time now industry has been making a somewhat different case. Multiple surveys have shown CEOs ranking important applied skills, with professionalism/work ethic, written communications, oral communications, teamwork/collaboration, and critical thinking/problem solving as the top 5. “applied skills integrated with core academic subjects are the ‘design specs’ for creating an educational system that will prepare our high school and college graduates to succeed in the modern workplace” (The Conference Board, 2006, p.9). These and other findings indicate that applied skills (e.g. communication and critical thinking skills) on all educational levels trump basic knowledge and skills such as reading comprehension, science, and mathematics (The Conference Board, 2006, Hart Research Associates, 2013), and even advocates for STEM cite the importance of critical thinking and communication skills as necessary in addition to technical knowledge (Vilorio, 2014).

Indeed, the World Economic Forum (WEF) notes that “Overall, social skills—such as persuasion, emotional intelligence and teaching others—will be in higher demand across industries than narrow technical skills” (World Economic Forum, 2016). Among more STEM-related skills such as ICT

literacy and mathematical reasoning, WEF also cited active learning, creativity and active listening and critical thinking as vital in the new workplace (Ibid.). Top-tier engineering programs in the US are now acknowledging that engineering education should incorporate such skills (Stanford, 2015), and the value of Liberal Arts education in general and for Engineers has been noted in the US as well (Association of American Colleges and Universities, 2014, Stanford University, n.d).

## **1.2. Texas A&M University at Qatar**

Education City is one of the major initiatives of Qatar Foundation, considered a driving “engine” of Qatar’s National Vision goals (Qatar Foundation, n.d.), and houses six US, one French, and one British university, as well as a Faculty of Islamic Studies. Texas A&M University at Qatar (TAMUQ) confers four Engineering degrees, with a stable undergraduate enrollment of around 400 for the last several years.

TAMUQs executive leadership has noted on numerous occasions that local engineering industry leaders often comment that they value TAMUQ graduates due to the fact that they are “good communicators,” (Kent, personal communication, January 21, 2010) and a recent study conducted in Qatar revealed that TAMUQ alumni engineers (mostly early career) on average spend 31.5% of their working day (2.5 hours) on writing tasks (Hodges, A., Rudd, M., & Bickham, T. 2015). These figures increase as engineers move up the managerial ladder; other studies have indicated that engineers spend between 40-70% of their day on writing tasks, mostly correspondence (Cunningham & Stewart, 2012). However, outside of internships, TAMUQ students often have few opportunities for experiential learning of these aforementioned workplace soft skills so highly valued by employers.

## **1.3. Course, Students, and Instructor**

The course in question is a technical and business writing class, a liberal arts requirement required by students in all four of TAMUQs engineering majors. The author has used a multi-term project-based learning paradigm for his syllabus: a bi-lingual oral history website project created by multiple technical writing classrooms. This would create the knowledge gap necessary for both academic and technical skills, as well as foster the interpersonal skills valued by employers.

The author’s previous career as a technical writer in the software industry informed his task- and project-based approach to the classroom. Having never been ‘tested’ in the academic sense of the word, and having worked with a variety of stakeholders on collaborative projects, the author sees process and negotiation/collaboration as central to effective technical communication.

However, the expectations and constraints of a university classroom with ELL students from several continents and numerous educational backgrounds were expected to, and did, provide the major challenges toward implementing this approach, as will be shown below.

## **2. Teaching methodology**

While some studies warn that the human “cognitive architecture” requires a more heavily-guided approach to learning, especially in early and intermediate learners (Kirschner, Sweller, & Clark, 2006), there is evidence that inductive learning may present advantages motivationally (Albanese & Mitchell, 1993, ) and cognitively over a more traditional teacher-centered lecturing approach, especially in the flexible application of knowledge (Dochy et al.,2003, Schwartz, Bransford, & Sears, 2005, as cited in Schmidt et al., 2006).

However, the author chose his teaching methodology based on his experience in the technology field, where he had neither formal training, rubrics, or assessment to learn both documentation styles and technical/coding skills. He also hypothesized that these students were not strictly English Language Learners and all would have at least been exposed to the basic concepts of rhetorical, including appeals and audience analysis (all having previously passed the TAMUQ Composition & Rhetoric Course, a First Year English common core course for all TAMU students back in the United States as well). Emphasis was also on the fact that at least some amount of subjectivity existed in reading any document.

While the current course focused on document and illustration design as well as information presentation, exemplification has also previously been used in teaching scientific concepts (Oliveira & Brown, 2016).

For progress report and usability reports, the author offered an official/professional exemplar as well as multiple student examples from previous classes to introduce the assignments. Instruction took the form of display to the class and student reaction to various elements in the documents. Students created individual positive/negative lists for each example, then compared as pairs, then as a full class. This class discussion revealed both the subjective nature of human communication, and certain commonalities amongst students’ reactions to how information was presented, which generally paralleled textbook (Dragga & Tebeaux, 2010) lists of technical writing principles.

For example, in one case, students were shown a long (almost full page) paragraph, and asked “do you want to read this long paragraph?” to which all answered “No.” When asked students “why not?” students gave responses typified by such statements as “it’s too boring” or “it’s hard to read a long paragraph.”

Such ad hoc student surveys were often used to determine if, regardless of individual differences, common principles could be found and agreed upon.

In this fashion, students worked out and dealt with criteria for effective document writing together as well as with the instructor’s input. However, a salient feature of this approach which diverged from many students expectations was the lack of set rubrics for the assignments, which, as we shall see, was a source of frustration for numerous students.

Students were given an explanation of the grading methodology, which the instructor termed “*bad boss*” / “*busy boss*” Students were told repeated that, as according to Dragga and Tebeaux’s - and the course’s - textbook “no one wants to read what you write” (2010, p.), which corroborated the instructor’s industry experience.

Holistic grading was used and comments were added in real time as the instructor read the reports - as technical and business communications are reacted to in industry settings. Any confusion, lack of information needed for any section, or mis-presentation of information according to the generally agreed principles was noted.

Because document and graphic design are both major factors influencing readability, these were given relatively similar grading weight (depending on their importance to understanding major points of reports) when compared with textual information.

A heavy emphasis on collaborative work and communication within teams (either three or four students) added to the ad hoc and qualitative nature of the student experience.

### 3. Case Study Methodology

Class discussions: the author made brief post-class notes on particular issues raised by students class discussions, such as disparities between what the “textbook” criterion for documentation design was and student reaction.

Directed reflections: towards the end of each course, students were asked to write multiple page-long reflection papers which focused on their own learning in the course, thoughts on the applicability of that learning, and their own positive and negative reactions to assignments, assessment, and teaching methods.

### 4. Findings / Discussion

Students in each section of the course in this project were required to write a reflection paper at the end of the term.

While these are of course self-reporting to the instructor, the importance of giving candid information (especially negative/critical) so as to help improve the course was emphasized multiple times, and that grades were based only on the justification and detail given in the reflections.

The two common negative themes were:

- Numerous students had issues with the lack of rubrics, and found the inductive process of determining criteria of documents frustrating.
- Many students also wanted more quantitative marking, even after it was explained that all rubrics contain descriptors that are ultimately dependent on an individual’s interpretation of both the work and the descriptors.

However, most students had accepted the general tenet of such a qualitative and discovery-based learning method, often noting how much it differed from their previous instruction in their university careers thus far.

While this research is in initial phases and student reflections have not yet been coded, student reflections which specifically commented on the overall teaching approach used in the course are excerpted below, along with relevant contextual information for each.

1. Throughout this course I wasn’t completely satisfied how everything was carried. However, I admit that I’ve noticed some changes within my other classes in terms of decision making and group work. Be that as it may, I will still wait to evaluate my performance in other courses after this course to decide whether I’ve learned more skills or not.

The first skill I’ve learned in this course was a strange one which was taking my own decisions without instructions. I found this skill to be weird because I’ve never thought that it can be learned nor that I’d learn it in university! (Mohammed, Electrical Engineering, Spring 2016)

2. My communications skills were vastly improved as I realized some of the mistakes I consistently made and that I haven't realized because the projects that I worked on were "template" based. (Wael, Mechanical Engineering, Spring 2016)

3. At the beginning of the course, I thought that I am going to spend the whole four months on writing long, boring technical reports; however, rapidly things changed and I realized that it is more than a writing class. It is a place where you gain valuable skills and apply them in real life. Throughout the course my critical analysis skill grew up quickly. I have learned how to make decisions and how to do something without any instructions. (Maryam, sophomore, Electrical Engineering, Spring 2016)

4. To conclude, this overall experience has been challenging to me, as I'm not used to not knowing exactly what I need to do in each assignment, which if I look at it from a realistic perspective, it is how the world works, no one will give me a manual to how to do everything in life, and it's better I start learning this early on in life. (Ahmad, Freshman, Mechanical Engineering, Spring 2016)

5. The best part which I enjoyed while working on this project was freedom of decision making and team working. (Maha, sophomore, Electrical Engineering, Spring 2016)

6. Another aspect that made me feel so happy whilst working on this project is the fact that you did not treat us as students, but more like new employees in a professional working environment for the first time. I felt that I had a very important responsibility and taught me the importance of managing my time wisely, especially because we are working with other people. (Ahmed, Mechanical Engineering, Fall 2016)

7. Lastly, the most frustrating aspect of this course is the lack of clear instructions and grading criteria. Almost none of the given assignments in this course had a written grading criteria and prompt. The two pie charts below represent the percentage of the assignments grades by those with and without prompt and grading criteria. Not having a clear set of instructions and criteria to consult leads to confusion while doing the assignments. Giving samples of the assignments that are not worthy of a full mark in the first place, puts the students at the possibility of making mistakes that I believe are not because of shortage of performance... In all, this course had been interesting, helpful, and frustrating, but I have learned a lot. (Ahmed, Electrical Engineering, Fall 2016)

8. I wish I had taken it earlier in my freshmen or sophomore year instead of going through writing all those reports throughout the years and seeing grades being deducted for things which I had not known back then. It's a pity we can't travel back in time. Anyway, I really liked how the course was set up and the order in which the material was put forth. Starting by analysing similar papers/articles/tutorials found online or submitted in the past, searching for both negatives as well as positives of each item and then discussing them in class was a very nice and informative experience. (Syed, Mechanical Engineering, Senior, Fall 2016)

It should be noted that students 1, 2, and 4 had specifically brought complaints, in private, to the instructor regarding the lack of fixed/prescriptive grading criteria and exemplars (cf. reflection 7).

## 5. Conclusion

In brief, the inductive and problem-based approach the instructor used in his technical writing classes seemed to be both challenging and rewarding to students. Individual differences may have been based on personality type, learning style, and classroom group dynamics, which may be a direction for further research.

A common theme in student reflections was both the novelty of the approach and at least a willingness to consider its validity and application for future university work as well as their future careers. Here again, more detailed research, perhaps interviews with a third party, may reveal more information.

It also appeared that while all students had previously been exposed to a rhetoric class which would have ostensibly prepared them for a qualitative approach which allowed for subjectivity, many seemed to have difficulty fully embracing the concept within the context of a graded course in an engineering school. Again, further probing any connections between overall curricular culture and student expectations with this method would be warranted.

Ultimately, as the literature presented in the abstract and introduction note, if "overall, social skills—such as persuasion, emotional intelligence and teaching others—will be in higher demand across industries than narrow technical skills" (World Economic Forum, 2016), then opportunities for developing such skills need to be incorporated, explained, and valued in the university classroom.

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## DESIGNATION OF COGNITIVE STRUCTURES ASSOCIATED WITH THE CONCEPT OF FOLK SONG OF THE CANDIDATE TEACHERS OF MUSIC

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### Abstract

The purpose of this study is to handle the cognitive structures of the candidate teachers of music associated with the concept of folk song; and to designate their alternative concepts. For this aim, the sample group of the study has been chosen from the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> year students studying in the Music Education Department of the faculty. Some students couldn't participate in the study. The number of those who participated is 105, between 18-22. In this study, the data has been collected by means of a free word-association test, as one of the testing and evaluation alternatives. For this purpose, the concept of 'folk song' has been written on a sheet of A4 paper for five times under the other; and the candidate teachers of music have been asked to write words associated with 'folk song'. They have also been asked to write a sentence about the concept.

First of all, the collected data has been numbered from 1 to 105. Associated concepts have been coded one by one; and the codes have been collected under a title like 'proper and meaningful categories'. It has been observed that the candidate teachers of music have mostly associated the concept of 'folk song' with the concept of 'bağlama'. They have also used the terms "Turkish folk music", "nation", "region", "Anatolia", "custom", "culture" mostly. It has been determined that the concepts that teacher candidates have at least been related to the concept of folk songs are words such as music and sound. When the prospective teachers analyzed the sentences they wrote about the concept of folk song, it was seen that the prospective teachers did not have alternative concepts. It has been seen that the cognitive structures of the teacher candidates have formed in meaningful structure with the concept of folk song.

It was determined that the teacher candidates did not have difficulty in writing the words related to the concept of folk song but they could not associate the folk song concept with the music as a sufficient level. From these results, it is proposed that musical teacher candidates construct and conceptualize musical concepts correctly and consider important concepts in musical education in a comprehensive way.

**Keywords:** Folk song, music education, candidate teachers of music.

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### 1. Introduction

As a cultural element, music interacts with other elements of the culture, so the community overflows with all the cultural elements and constantly transmits them to the future. (Şengül, 2007: 927).

Each nation has its own art in the general folklore of its people. If folk composed of customs, customs and traditions are made up of art, melody and rhythm, folk literature, if the folk music, speech and poetry are formed, maintains its cultural existence under the name of folk dances if it is composed of a number of rhythmic movements.

Folk songs, which have played an important role in the field of folk culture in terms of the values they carry as traders of the tradition, have been the field of research in the studies on Traditional Turkish Folk Music. The Encyclopedic Dictionary of Literary Terms is defined as "the type of folk poetry that is more or less pronounced and performed with various melodies and different authorities. (Karataş 2001:438). Folk songs express pleasure, sorrow, excitement, enthusiasm, anger, system and many more feelings of the Turkish people, as well as the physical and human characteristics of the place where they live, verbal or nonverbal melodies. There is also the possibility and the artistic aspect of the folk who have been part of a tradition for many years, that our folk literature has poetry spoken in tune with melody. Folk songs are related to many disciplines because of the characteristics of the past, such as the resilience of the past, the broadness of the geography spoken as a song. Folk songs, which can be found in many branches of science such as literature, history, religion, philosophy, sociology, folklore, can find

their place in geography as well as in terms of various differences according to regions (Şahin,2010 ).Folk songs have become a general concept that has been used by our people for all types of folk music in spite of the fact that folk literature is the type of poetry spoken in tune.

This research was carried out in order to determine what kind of perception the folk songs constituted in the people who would be music educators and which words and concepts were cognitively related.

## 2. The Aim of This Study

The aim of this study is to determine the cognitive structures related to the concept of "folk songs" by using the independent word association test of music teacher candidates.

## 3. Methods

Qualitative research method was used in this study. According to Yıldırım and Şimşek (2006), qualitative research is a method of research aiming to reveal a phenomenon that can be seen from the point of view of related individuals and to reveal the processes of this viewpoint.

This study, which was held in 2015-2016 academic year, Necmettin Erbakan University Ahmet Keleşoğlu Registered in music teaching department of Faculty of Education 1.2.3.4. a total of 105 musical teacher candidates attended the class.

As a data collection tool in this research; It is aimed to collect detailed data about the conceptual structure of the concept of "Folk song" of music teacher candidates by using independent word association test. When applying the measuring instruments introduced below, care was taken to explain the difficulty in giving and receiving the required training.

The independent word association test is one of the most common techniques used to analyze the cognitive structure of individuals and the linkages between concepts in this structure and is used to determine whether the relationships between long term memory concepts are sufficient (Kurt,2014). This technique is based on the assumption of answering independent of the stimulus word, without limiting the idea to the mind (Bahar & clg., 1999; Sato& James, 1999).

In this study, the concept of "Folk Song" was asked as a stimulating word for completing the independent word association test for teacher candidates. The word association test consists of two steps. First stage; In the prospective teacher-independent word association test, stimulant heel has to respond to the concepts brought to mind by a certain period of time. This period is 40 seconds for this study (Gussarsky&Gorodetsky, 1990). In the second phase; It is stated that the teacher candidate should write sentences about the key concept within 20 seconds given.

### 3.1. Data analysis

The data were analyzed according to the content analysis method. Content analysis is a scientific approach that enables verbal, written and other materials to be examined objectively and systematically and organized according to certain categories (Leblebici & Kılıç, 2004; Tavşancıl & Aslan, 2001).

The process of analyzing and interpreting the answer sheets of the prospective teachers was made at the following stages; 1.Examination of papers,2.Unsuitable paper sieving stage,3.Recompilation phase,4.The number of participants' answer sheets numbered from 1 to 105, 5.Category development phase,6.The stages of determining the distribution of the categories by examining the concepts, 7.The stage of validity and reliability,8.The calculation of the frequencies of the concepts obtained and 9.the phase of interpretation of the data. The data obtained from the independent word association test were analyzed using the number of words, the number of responses and the semantic relationship technique (transfer: Kurt,2013). The words answered with the same meaning are classified under the most frequently repeated words. e did not evaluate the words that were not associated with the categories, that were not related to other words, were not related to the subject and were repeated once. In these processes the words are categorized by using the semantic relation criterion and the frequencies of the words in each category are calculated. Many studies show that this type of data analysis technique provides safe results (Kostova ve Radoynovska, 2008; Kostova ve Radoynovska, 2010).

### 3.2. Validity reliability

In this context, three important processes have been carried out in order to ensure the validity of the results of the research: (a) The structures involved in coding the data and how to arrive at the conceptual categorization under the data analysis process are explained in detail (transfer:Kurt,2013), (b) For each of the categories obtained in the survey, the opinions of the presumptive teacher candidates for each of the examples were included in the selected findings section (Yıldırım ve Şimşek, 2006). In order

to ensure the reliability of the research, the coherence of the codes used independently by the two field experts after they were separately coded was determined by marking them as "Opinion association" or "Opinion separation". The reliability of data analysis in this way; [Opinion union / Opinion share) x 100] formula (Miles ve Huberman, 1994). The average reliability between the encoders was found to be 90%.

#### 4. Findings

Table 1. Distribution of Cognitive Constructs of Music Teacher Candidates Related to the Concept of "Folk Song" by Categoricals.

| <i>Categories</i>                     | <i>Categorized Concepts and Frequencies</i>   | <i>Total for Category Frequencies</i> |
|---------------------------------------|---|---------------------------------------|
| <b>Turkish Folk Music Expressions</b> | <i>Bağlama 35(A folk instrument used in Anatolia)</i>   | 85                                    |
|                                       | <i>Turkish Folk Music 13</i>  |                                       |
|                                       | <i>Lament 9</i>   |                                       |
|                                       | <i>Naga 6</i>   |                                       |
|                                       | <i>Anonymous 5</i>  |                                       |
|                                       | <i>Bozlak 4 (The subject is pathetic folk song)</i>   |                                       |
|                                       | <i>Makam 3 (The name given to the format of the processing of an index in Alaturka music)</i>   |                                       |
|                                       | <i>Oyun Havası 2 (Folk music, accompanied by traditional dances, chirping rhythmic music.)</i>  |                                       |
|                                       | <i>Uzun Hava 2 (In turkish folk music, folk song that has become distinctive by developing under the influence of regional elements with not being a distinct character.)</i> |                                       |
|                                       | <i>Larynx 2</i>   |                                       |
|                                       | <i>Hüseyni 2 (Name of a makam in turkish music)</i>   |                                       |
|                                       | <i>Suda balık oynuyor türküsü 2(a name of Turkish folk song)</i>  |                                       |
| <b>Cultural Expressions</b>           | <i>people24</i>   | 62                                    |
|                                       | <i>culture 14</i>   |                                       |
|                                       | <i>Tradition 4</i>  |                                       |
|                                       | <i>Custom 4 (Habit of doing as the grandfathers see from the ancestors.)</i>  |                                       |
|                                       | <i>essence 4</i>  |                                       |
|                                       | <i>Turkish people3</i>  |                                       |
|                                       | <i>Örf 3 (The tradition of rule, principle, which the people spontaneously follow.)</i>   |                                       |
|                                       | <i>Nation 2</i>   |                                       |
|                                       | <i>Homeland 2</i>   |                                       |
| <i>Our personal self 2</i>            |   |                                       |
| <b>Emotional Expressions</b>          | <i>Emotion 13</i>   | 52                                    |
|                                       | <i>Pain 8</i>   |                                       |
|                                       | <i>Sadness 6</i>  |                                       |
|                                       | <i>Hanker 5</i>   |                                       |
|                                       | <i>Longing 5</i>  |                                       |
|                                       | <i>Feeling 4</i>  |                                       |
|                                       | <i>Foreign land3</i>  |                                       |
|                                       | <i>Love 2</i>   |                                       |
|                                       | <i>Joy 2</i>  |                                       |
|                                       | <i>Dream 2</i>  |                                       |
|                                       | <i>Color 2</i>  |                                       |
| <b>Geographical Expressions</b>       | <i>region 22</i>  | 50                                    |
|                                       | <i>Anatolia 14</i>  |                                       |
|                                       | <i>Village 6</i>  |                                       |
|                                       | <i>Domestic 3</i>   |                                       |
|                                       | <i>nature3</i>  |                                       |
|                                       | <i>Kırşehir 2 (A city in Turkey)</i>  |                                       |

Table 2. Distribution of Cognitive Constructs of Music Teacher Candidates Related to the Concept of "Folk Song" by Categoricals (Cont.).

| <i>Catogories</i>                   | <i>Categorized Concepts and Frequencies</i>                                    | <i>Total for Category Frequencies</i> |
|-------------------------------------|--|---------------------------------------|
| <i>Experience Expressions</i>       | <i>True life experience</i> 8  | 20                                    |
|                                     | <i>Past</i> 6  |                                       |
|                                     | <i>Old</i> 4   |                                       |
|                                     | <i>life</i> 2  |                                       |
| <i>General Musical Expressions</i>  | <i>Sound</i> 6   | 18                                    |
|                                     | <i>Music</i> 4   |                                       |
|                                     | <i>song</i> 3  |                                       |
|                                     | <i>Soloist</i> 3   |                                       |
| <i>Musical Identity Expressions</i> | <i>Neşet Ertaş</i> 15  | 27                                    |
|                                     | <i>Folk poet</i> 6   |                                       |
|                                     | <i>Aşık Veysel</i> 4   |                                       |
|                                     | <i>Aşık</i> 2 (Person who reads unprepared poetry on instrument accompaniment) |                                       |
| <b>Total</b>                        | <b>52</b>  | <b>314</b>                            |

## 5. Discussion Conclusions and Recommendations

Based on the results of the analyzes, cognitive structures related to the concept of folk song were determined from the words stated by the participants. At the end of the research, the cognitive structures of the music teacher candidates related to the concept of folk songs were collected under a total of 7 categories. These are listed as "Turkish Folk Music Expressions", "Cultural Expressions", "Emotional Expressions", "Geographical Expressions", "Experience Expressions", "General Musical Expressions", "Musical Identity Expressions". 52 different words related to the concept of folk songs were distributed in 7 categories and 314 answer words were obtained in this context. The "Turkish Folk Music Expressions", which has the highest frequency value and the intensive cognitive structures of the teacher candidates, emerged as the dominant category. In this category, most of the participants were selected as "Bağlama (A folk instrument used in Anatolia)", "Turkish Folk Music", "Lament", "Naga", "Anonymous", "Bozlak (The subject is pathetic folk song)", "Makam (The name given to the format of the processing of an index in Alaturka music)", "Oyun Havası (Folk music, accompanied by traditional dances, chirping rhythmic music.)", "Uzun Hava (In turkish folk music, folk song that has become distinctive by developing under the influence of regional elements with not being a distinct character.)", "Larynx", "Hüseyini (Name of a makam in turkish music)", "Suda balık oynuyor türküsü ( a name of Turkish folk song)"

As the dominant category is the Turkish Folk Music Expression category, the teacher candidates have to associate the folk song concept with the folk music expressions, indicating that the cognitive perceptions have improved in the right direction. It is natural for the folk song concept of the cultural expressions category to be associated with the people because the people songs of the Turkish Folk Music originate from the people, they are goods to the people, they describe the people and they define the people. Geographical expressions and a form of Turkish Folk Music seem to be two areas that are not very interesting at first glance, but as a result of the in-depth study of folk songs, it seems that there are actually two areas that are not far from each other. This is evidenced by the distribution of geographical terms in folk songs, and the musical characteristics varying from region to region. It is an expected result that the local word is one of the most used words. It can be said that the folk songs of the words of emotion and liveliness are caused by the fact that the Turkish people are the verbal works expressed by the Turkish people as much as the experience of the whole life, pleasure, sorrow, excitement, enthusiasm, anger, system and many more feelings. It has been determined that the teacher candidates are not at a sufficient level without expressing the folk songs in general music terms and expressing them as a musical genre. This can be interpreted as a lack of sufficient knowledge of general music concepts and music genres. In addition, the participants have associated the word of folk song with popular poets such as Neset Ertaş and Aşık Veysel, who were interpreters of the sentiments of the people. When the sentence examples that the students made about the key concept of "folk songs" are examined, it is seen that there are few examples of sentences containing scientific information. This situation shows that students cannot learn the concept of folk song by scientific definition. However, there are also many examples of non-scientific or superficial information sentences. The prospective teachers tried to explain only simple and non-scientific expressions without considering all aspects of the concept. According to this result, teacher candidates personalize the conceptual structures related to the concept of folk songs and show that

there are not enough cognitive structures at academic level in some subjects, which can be interpreted that teacher candidates have limited knowledge at some subjects.

Unfortunately, we could not find a way to compare this work with other works in the field of music because we could not find the work done with independent word association method related to the concept of "folk song" in the literature. Concept teaching and conceptual learning are the main topics of educational activities. It should not be forgotten that concept learning is a consequence of both the scientific knowledge taught at school and the knowledge learned in everyday life. Therefore, scientific knowledge taught at school should be conscious, permanent and predominant. However, it is possible to ensure that concepts are learned correctly. To make applications using appropriate methods and techniques for every purpose of education; It will facilitate the teaching and learning of concepts correctly. The most important task of teachers in this regard is to ensure that concepts are learned with the true meaning of the students. As a result; Concept learning is very important in terms of being able to think about the subject as a whole. It is imperative to emphasize the importance of learning the concepts correctly at each teaching stage and to complete the deficiencies.

Using the results of this research, the following suggestions can be presented on the subject: It may be advisable to ensure that cognitive structures of the Concepts used in the Music are made permanent and correct and that they are trained in the effective use of cognitive strategies in order to ensure that the music teacher candidates successfully learn the concepts. It should not be forgotten that the teacher candidates who will be teachers of the future will provide qualified education to their students through qualified education. At every stage of the teaching, it can be suggested that the content of the course, education-training activities and measurement-evaluation stages are arranged according to these determinations by determining the cognitive structures of the students about the concepts at the beginning and end of the course.

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# INVESTIGATING THE CLASSIFICATION PERFORMANCES OF SUPPORT VECTOR MACHINES AND LOGISTIC REGRESSION: A CASE STUDY ON PISA 2012

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## Abstract

Investigating factors that significantly affect the students' academic performance is an important research area in educational studies. When the relationship between factors and academic performance is truly known, it can be possible to monitor the current problems and take precautions in order to improve the quality of education system. In this sense, choosing the most appropriate method is one of the most challenging subjects for researchers. In recent years, data mining methods have been becoming very popular which give reliable solutions and applied easily for complex huge data sets related with educational environment. In this study two data mining classification methods such as Support Vector Machines (SVM) and Logistic Regression (LR) are used. SVM is one of the important classification algorithms which based on statistical learning theory and structural risk minimization. The main principle of SVM is to find optimum separating hyperplane that divide the data into two classes. LR is a regression model that allows using two categorical variables as a dependent variable. The unknown regression coefficients are estimated by using maximum likelihood estimation with maximizing the likelihood function. These methods are compared in terms of their prediction and classification performances for the study of Programme for International Student Assessment (PISA) in 2012 which is the last released data from the International Association for the Evaluation of Educational Achievement (IEA). The dataset for fifteen years old Turkish students studying in primary education schools is used. Results not only show the best performing classification algorithm, but also determine the important factors that affect the students' academic performance.

**Keywords:** *Support vector machines, logistic regression, PISA, academic achievement.*

## 1. Introduction

Data mining is a multidisciplinary methodology that includes many different statistical procedures such as classification, clustering and prediction algorithms. Also, it has no strict assumptions such as the linearity, variance homogeneity and normality (Sinharay, 2016). These techniques are using many different disciplines such as educational, telecommunication, finance, medicine and retail. Studies with using data mining methods in the field of education is generally known as educational data mining (EDM) and an extensive literature were reviewed by Romero and Ventura (2007) for the period between 1995 and 2005.

In previous studies, researchers worked on machine learning techniques to classify students in terms of their performance (Cortez & Silva, 2008; Ramaswami & Bhaskaran, 2010; Kotsiantis, Pierrakeas, & Pintelas, 2010). Furthermore, factors affecting students' achievement were studied in order to determine the most important factors and create strategy for related parties (Topcu, Erbilgin, & Arıkan, 2016; Yıldırım & Demir, 2014; Liu & Meng, 2010; Wößmann, 2005). Despite several works have been done regarding the EDM at national level, there is still lack of works used supervised learning methods for international assessment studies.

This main purpose of this study is to fill in the gap in the current literature for Programme for International Student Assessment (PISA) 2012 data by performing Support Vector Machines and Logistic Regression algorithms. Classification results are compared in terms of their classification accuracy. In the

process of measuring classification accuracies of algorithms, Kappa, MAE and RMSE statistics, which are widely used performance measures, are taken into consideration. During the selection of best performing classification algorithm, both demographics/socio-economic characteristics and students' attitudes towards mathematics are included in models as probable influence factors on mathematics achievement. The research questions of this study can be designed as the following:

- i) Which method has the best classification performance based on model performance measures?
- ii) Which factors are found significant on mathematics achievement and what are the importance ranks of these factors?

## 2. Methodology

### 2.1. Support Vector Machine (SVM)

Support vector machine, which is one of the non-parametric controlled classifiers, is a supervised learning method used for classification (Shahiri, Husain, & Rashid, 2015). The basic principle behind the SVM is that units are divided into two (or more) groups with linear or non-linear SVMs. Nonlinear SVMs transforms data into linear SVMs by using a kernel function (Oz & Kaya, 2013). Nonlinear SVMs maps input data to a higher dimensional space, besides, they can build higher classification. SVM operator includes of kernel types consisting polynomial, neural, sigmoid and radial basis function (RBF) that are used to solve in the classification problem (Pierrakeas & Pintelas, 2010).

### 2.2. Logistic Regression

When the response variable is discrete, it cannot be used linear regression model. In this case, logistic regression model is preferred. This model is a generalization of linear regression which investigates the relationship between response and independent variables (Tatlidil, 2002). For binary classification problems,

$$E(Y|X = x) = \frac{e^{x'\beta}}{1 + e^{x'\beta}} = \frac{1}{1 + e^{-x'\beta}} \quad (1)$$

where  $\beta$  is a vector of  $k$  regression parameters. It can be parameterized the possible cases according to

$$\log\left(\frac{E(Y|X = x)}{1 - E(Y|X = x)}\right) = x'\beta \quad (2)$$

Equation (2) gives to the log odds model. It can be used maximum likelihood estimation method to estimate the unknown regression parameters which maximizes the logarithmic likelihood function (Hosmer & Lemeshow, 2000).

## 3. Application

The data analyzed in this study are from PISA 2012 for 15-year old Turkish students. The sample consisted of 3053 students. The response variable is MATHACH that is used to transform to a binary variable in this study. The average mathematics score for Turkey is 448. If the score is over 448, then MATHACH is taken as 1; if not MATHACH is taken as 0. In order to determine the factors affecting mathematics success, sixteen variables are included.

10-fold cross validation is used for testing the accuracy of the classification of the three classification algorithms in this study. We used WEKA software which includes several machine learning algorithms for data mining tasks.

## 4. Results

In the light of previous studies (Kilic, Cene & Demir, 2012; Koğar, 2015), 16 variables are selected to compare the results of different machine learning classification algorithms. These variables codes and descriptions are given in Table 1.

Table 1. Descriptions of the variables in the study.

| Feature Name | Description                                  | Feature Name | Description                                   |
|--------------|--|--------------|---|
| ANXMAT       | Mathematics Anxiety                          | ESCS         | Index of economic, social and cultural status |
| ATSCHL       | Attitude towards School: Learning Outcomes   | HEDRES       | Home educational resources                    |
| ATTLNACT     | Attitude towards School: Learning Activities | HOMEPOS      | Home Possessions                              |
| BELONG       | Sense of Belonging to School                 | MTSUP        | Mathematics Teacher's Support                 |
| CLSMAN       | Mathematics Teacher's Classroom Management   | SCMAT        | Mathematics Self-Concept                      |
| COGACT       | Cognitive Activation in Mathematics Lessons  | STUDREL      | Teacher Student Relations                     |
| CULTPOS      | Cultural Possessions                         | WEALTH       | Wealth  |
| DISCLIMA     | Disciplinary Climate                         | ST04Q01      | Gender  |

Kappa statistic, Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) are commonly used measures for classification performance of each classification algorithms. It is desirable that the Kappa statistic is close to 1, the MAE and RMSE are small in order to determine the best classification algorithm.

Table 2. The summary of classification performance measures for each algorithms.

|                 | Poly Kernel | RBF Kernel | Logistic Regression |
|-----------------|-------------|------------|---------------------|
| Kappa statistic | 0.3764      | 0.3619     | 0.3880              |
| MAE             | 0.3059      | 0.3105     | 0.3919              |
| RMSE            | 0.5531      | 0.5572     | 0.4436              |

According to Table 2, the performance measures have similar Poly Kernel and RBF Kernel algorithms. Although Logistic regression has the lowest RMSE statistic, Logistic Regression is the best performer algorithm in terms of Kappa and MAE statistics, which are 0.388 and 0.3919, respectively.

Table 3 shows the result of different classifiers which include TP rate, FP rate, precision, recall, F-measure, MCC, ROC and PRC values for all algorithms.

Table 3. The various classifier measurements of each algorithm.

|                     | Class         | TP Rate      | FP Rate      | Precision    | Recall       | F-Measure    | MCC          | ROC Area     | PRC Area     |
|---------------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Poly Kernel         | 0             | 0.775        | 0.403        | 0.697        | 0.775        | 0.734        | 0.371        | 0.678        | 0.663        |
|                     | 1             | 0.597        | 0.225        | 0.689        | 0.597        | 0.640        | 0.371        | 0.678        | 0.595        |
|                     | Weighted Avg. | <b>0.694</b> | <b>0.322</b> | <b>0.694</b> | <b>0.694</b> | <b>0.691</b> | <b>0.371</b> | <b>0.678</b> | <b>0.632</b> |
| RBF Kernel          | 0             | 0.811        | 0.456        | 0.680        | 0.811        | 0.740        | 0.371        | 0.678        | 0.655        |
|                     | 1             | 0.544        | 0.189        | 0.707        | 0.544        | 0.615        | 0.371        | 0.678        | 0.592        |
|                     | Weighted Avg. | <b>0.689</b> | <b>0.334</b> | <b>0.692</b> | <b>0.689</b> | <b>0.683</b> | <b>0.371</b> | <b>0.678</b> | <b>0.626</b> |
| Logistic Regression | 0             | 0.760        | 0.375        | 0.708        | 0.760        | 0.733        | 0.389        | 0.761        | 0.770        |
|                     | 1             | 0.625        | 0.240        | 0.685        | 0.625        | 0.654        | 0.389        | 0.761        | 0.735        |
|                     | Weighted Avg. | <b>0.699</b> | <b>0.313</b> | <b>0.698</b> | <b>0.699</b> | <b>0.697</b> | <b>0.389</b> | <b>0.761</b> | <b>0.754</b> |

The result of three classifier algorithms and their performance measures are summarized in Table 3. Logistic regression has the highest TP rate, Precision, Recall, F-measure and MCC than other algorithms. TP rate means that 69.9% data defined by these classes are classified correctly. MCC is the same value at Poly Kernel and RBF Kernel algorithms. Logistic regression has the highest value of ROC Area and PRC area than others. In this study, Logistic regression falsely classified 31.3% as a given class.

Table 4. The confusion matrix for different classification algorithms.

| Classified as | Poly Kernel |     | RBF Kernel |     | Logistic Regression |     |
|---------------|-------------|-----|------------|-----|---------------------|-----|
|               | (a)         | (b) | (a)        | (b) | (a)                 | (b) |
| <b>a = 0</b>  | 1289        | 374 | 1349       | 314 | 1264                | 399 |
| <b>b = 1</b>  | 560         | 830 | 634        | 756 | 521                 | 869 |

As seen in Table 4, the confusion matrix which shows the overall correct classification ratio for each algorithm is given. Correct classification ratios are over 69% for all algorithms. In all algorithms, correct classification ratios of students who has lower mathematics score than country average are around 76% and 81%, while correct classification ratios of students who has higher mathematics score than country average are around 54% and 63%. Overall correct classification ratios of Poly Kernel, RBF Kernel and Logistic regression algorithms are 69%, 69% and 70%, respectively. Logistic regression algorithm has the highest correct classification ratio with 70%. RBF Kernel has the lowest correct classification ratio which is 69%. According to Table 2, 3 and 4, one can conclude that it is logical to use Logistic regression algorithm in order to classify students' mathematics achievement.

Table 5. Ranking of factors.

| Correlation Ranking Filter |          | Gain Ratio |          | Info Gain |          |
|----------------------------|----------|------------|----------|-----------|----------|
| Rank                       | Name     | Rank       | Name     | Rank      | Name     |
| 1                          | ESCS     | 1          | HOMEPOS  | 1         | ESCS     |
| 2                          | HOMEPOS  | 2          | ANXMAT   | 2         | HOMEPOS  |
| 3                          | ANXMAT   | 3          | HEDRES   | 3         | HEDRES   |
| 4                          | HEDRES   | 4          | SCMAT    | 4         | ANXMAT   |
| 5                          | WEALTH   | 5          | WEALTH   | 5         | WEALTH   |
| 6                          | SCMAT    | 6          | CLSMAN   | 6         | SCMAT    |
| 7                          | DISCLIMA | 7          | DISCLIMA | 7         | CLSMAN   |
| 8                          | CLSMAN   | 8          | ESCS     | 8         | DISCLIMA |
| 9                          | CULTPOS  | 9          | CULTPOS  | 9         | CULTPOS  |

The top ranking features are produced by different attitude selection methods in WEKA. These methods are Correlation Ranking Filter, Gain Ratio and Info Gain which find important feature in this study. In Table 5, ESCS, HOMEPOS, ANXMAT, HEDRES, WEALTH, SCMAT, DISCLIMA, CLSMAN and CULTPOSS can be listed as high potential features.

## 5. Discussion and Conclusions

In this study, there are two main research questions, which are "Which method has the best classification performance based on model performance measures?" and "Which factors are found significant on mathematics achievement and what are the importance ranks of these factors?". To find logical answers of these questions, we have mentioned to predict students' mathematics achievement by using machine learning algorithms with demographic, school and family related factors.

To answer first research question, Two SVM algorithms, namely Poly Kernel and RBF Kernel, and logistic regression are performed to the data. According to several important classification performance measures, best performing algorithm is found as logistic regression. Logistic regression has the highest value of ROC Area and PRC area than others and also it is the best performer algorithm in terms of Kappa and MAE statistics.

WEKA attitude selection method (i.e., Correlation Ranking Filter, Gain Ratios and Info Gain) is used to answer second research question. ESCS and HOMEPOS are found the most important factors on mathematics achievement (Rutkowski & Rutkowski, 2013; Tatlı, Ergin, & Demir, 2016). Furthermore, 9 (out of 16) variables, which are ESCS, HOMEPOS, ANXMAT, HEDRES, WEALTH, SCMAT, DISCLIMA, CLSMAN and CULTPOS, are found the important factors on mathematics achievement (Demir, 2016; Kilic, Cene & Demir, 2012).

In conclusion, this study could be a starting point for further investigation and validation into the predicting mathematics achievement. This research could provide important information for students' achievement as for the action planning of the Turkish Educational system. Therefore, more investigation with alternative models can cross validate the present research.

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## **SENSUAL EXPERIENCE IN DESIGN: SEEING AND IMAGINATION IN STUDIO ENVIRONMENT**

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### **Abstract**

In design education it is important to encourage students to create their own way through meaning, context, abstraction or formal relations. There are several pedagogies that are applied in studio environment with this regard. When dealing with design problem, students engage their basic knowledge about design with their experiments, skills and capabilities. In this paper aesthetic experience has considered as one of the linkage with design and designer. Aesthetic experience is an extensive subject that has been considered and discussed for centuries. However, within the scope of this paper it will be addresses as sensual experience through art. In Dewey's pragmatic approach aesthetic experience derives in the context and linked to object and subject as well as sensuous sense and meaning (Dewey, 1934; Folkman, 2013, p.33). In order to capture how design students can conduct design process through a visual experience and imagination a case study was conducted with five 3<sup>rd</sup> year interior architecture students.

**Keywords:** *Design education, aesthetics experience, visual senses, basic design.*

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### **1. Introduction**

As a formal educational concept, basic design was firstly introduced in Bauhaus in Germany in 1919. The foundation manifesto of Bauhaus, was to gather all creative workers such as architects, sculptors, painters and train at same level as craftsmen. Based on this approach an educational context which pursue for creation while relating materials, patterns and industrialized technologies with design had set (Denel, 1979). The foundation manifesto of Bauhaus was no longer exactly followed by the successors of Gropius. The pedagogical approach that was applied in the Bauhaus had gone through many transformations between 1919 and 1960's. The preliminary purpose of the Bauhaus was to combine arts and crafts and create a unique way of production instead of as mass production. When Carnap arrived Dessau in 1929, within the influence of the logical positivist faculty was divided between aesthetics and function (Denel, 1979). By the time, as a consequence of this architecture in Bauhaus carried out as a scientific subject, where the aesthetics was regarded as metaphysical. Especially during Meyer's brief tenure, the program was fulfilled with scientific and social problems regardless the aesthetics and artistic problems (Denel, 1979). Vhutemas", the "Chicago Bauhaus", and the "Ulm School" (Hochschule Fur Gestaltung) followed similar approaches after the Bauhaus.

In the end of the 1960's architecture started to evaluate as a social subject with physiological aspects. In those period aesthetic started to appear as a design element again. The scientific movement that emerged after 1960's, which is also called as "Design Method Movement" led scholars to understand the design process explicitly. Within this movement, while some researcher focused on mechanical and analytic view, others were concentrated on phenomenological and experimental aspects of design process (Arpak, 2012). Accordingly, aesthetics experience become visible again and valued as a research subject.

In this paper aesthetics will be regarded as sensual experience. According to Böhme sensual experience is related to ambience which establish a connection between subject and object; functions as a perceptual unit that aims to create sensual differentiations and can be both be experienced and manipulated (Bohme 1995; Folkmann 2010). In this senses, it is easy to capture sensual experience in space/interior design project or designed product rather than architectural scale. According to Findeli (2001) in order to understand a human or social system such as design, an aesthetic education will best way rather than mathematical or formalistic (like system or complexity theory) approach. Aesthetic dimension of design also related to ethical aspects of design (Findeli 2001, Folkman 2013), since designed object have a mediating role between human and its surrounding environment through

experience. According to Findeli (2001) competence in aesthetic decision-making will guarantee the ethical reasoning. Moral consideration will not be evaluated within the scope its paper, but relevance is remarked since it is important within the context of design education in general.

The 21<sup>st</sup> century scientific and technological approach values material performance over appearance, and processes over representation (Leach, 2009, p.34). However, the connection between senses, meaning and context is missing. In order to engage, students with the design objects, students need tools to employ. I believe connection is possible through basic design education that concerns both aesthetics and mathematical dimensions. Basic design courses in the first year design education, mostly aim to construct the knowledge that students can employ different tools in their design process. Thereby, they can enrich their creativity and imagination. In the following years, students are expected to gain experience at a certain degree in this sense. However, most of the tools they operate at first year abandoned by both students and instructors. In the following section, aesthetic experience will be evaluated in third year design studio as a medium that engage design and context. Correspondingly, visual senses and imagination will be investigated through a design case in the studio environment.

## 2. Case Study

In order to capture how design students can conduct design process through sensual experience and imagination a case study is conducted with five interior architecture students. Students were expected to have basic design knowledge and design skills at a certain level. As regards, the study is conducted among 3rd year design students. The same design problem had given to all students; they were asked to design a living unit in a 4x4x4 box. As a design medium physical model making used in all experiments in order to engage the students with material, space and action. Same model making materials such as cardboard, colour paper, acetate, rope, pins and sticks are provided to all participants. The students divided into two groups while first two students were asked to design through a sensual experience and other three through a context they developed.

One of the Cezanne paintings had given to first group before starting design and model-making process. Seeing is treated as a visual sensual experience. They were expected to see and sense the visual expression and interpret for their design case. As a medium they use sketch paper and make abstraction over the picture. This group will be named as Sensual group and the participant will be specified as S1 and S2. The second group which consist of three students is given the same design problems without the painting. They were asked to use their imaginative skills and create a living unit for their hero or role model. This group will be named as Fictional group and participant will be named as F1, F2 and F3.

The experiments were not time-limited. Each student had used as much as time they require. However, all the participant in fictional group finished their experiment before the sensual group. The duration of the experiments is shown in the Table 1.

Table 1. Duration of Experiments.

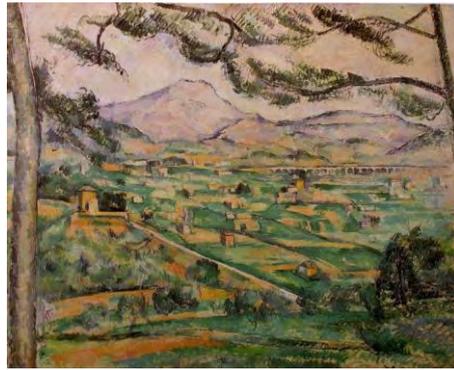
|          | Sensual Group |        | Fictional Group |       |        |
|----------|---------------|--------|-----------------|-------|--------|
| Student  | S1            | S2     | F1              | F2    | F3     |
| Duration | 70 min        | 89 min | 27 min          | 40min | 63 min |

Experiments held in the studio environment, where the students feel comfortable. After the experiments a small interview was held by each participant in order to gather detailed information about their design process.

### 2.1. Sensual Experiments

Seeing is treated as a sensual experience in this experiments. One of the Cezanne paintings were given as a visual input (Fig. 1). Participants were expected to see and interpret the visual experience in order to create their own design.

Figure 1. Paul Cezanne - *The Great Pine (Mont Sainte-Victoire)* - 1886 - 60 x 73 - oil on canvas.



Participant start their design process first abstraction. They both used sketch paper and interpreted the visual in different ways. C1 first examined the borders in the paintings. She captured the roads, fields and mountains as her borders. She reported that she thinks analytically as it is a project and try to express what does the borders means to her with lines (Fig.2a). She basically assigns a spatial meaning to each line she draws. Later she tries to connect her abstraction with her design visually and contextually both in her sketches and physical model.

Figure 2. Sketches show the design process of C1(on the left) and C2. C2 first sketch (2b) show the mapping of the strokes in the painting. (in the middle). 2<sup>nd</sup> sketch of C2 (on the right).



C2’s approach is completely different than C1. She reported that “What make novel this painting is I guess the distribution of the strokes rather than the view. Everybody can draw this scene but not in this way. So I try to map (by dots) the changing distribution of the density of the tree (the big tree in front of the painting)” Accordingly, she created the sketch (Fig. 2b) that consist of multiple dots that graphs the distribution of strokes in the painting.

In her second sketch C2 put another sketch paper over previous one and made random choices to create the organic form (Fig.2c). Later, in her third sketch on the right (Fig.2c) she reported that instead of random choice she created the shaped according the density of the points. She reported “choice I draw bigger shapes on low density parts and smaller more fragmented shapes on high density parts”.

C1 and C2 examined the paintings with totally different approaches. While C1 treat her abstraction at symbolic level and assign spatial meaning to very single line. On contrary, C2 treat her abstraction again as shapes and create different shapes over them. She used same approach on her model making process and create similar parts over her sketches. However, C1 had some difficulties to transfer her design into 3D and she said lost the meanings she assigned (Fig.3a).

Figure 3. Physical model of C1(on the left). Physical model of C2 (on the right). The smaller pieces are the part of the bigger pieces at the back.



C1 reported that the physical model remained too symbolic while C2 said time she'd like to create more parts similar to existing ones if she had time. (Fig.3b).

## 2.2. Fictional Experiments

In the second case, students were asked to use their imaginative skills and create a living unit for their hero or role model. In this case, it is aimed to capture the ability of the students to manifest their idea. This group will be named as Fictional group and participant will be named as F1, F2 and F3.

F1 used only ropes and created a living space for Spiderman. He reeved the rope through the given box arbitrarily. He reported that he tried to create pattern like spider's web but he couldn't make it because of the limitation of the material. F2 designed room for Frida Kahlo. She used acetate as material and divided living surface from the floor. She reported she considered the physical disability of Frida and create a space where she can freely move around. F1 and F2 's physical models are shown in Figure 4 respectively.

Figure 4. F1's model on the left and F2's model on the right.



Only F3 started his process by sketching. Other participant directly started to work with physical materials. He built a metaphorical relation in his model. He tries to create an ambience like Gotham city for Batman, which can change its colour and position according to sun (Fig.5). He reported that the city is dark and hanging in the night while Batman is around and when sun comes it depicts as normal city on the ground. He spent 36 minutes more than F1 and 23 minutes more than F2.

Figure 5. F3's sketch and model.



## 3. Discussions

It is observed from the experiments context development either from the sensual experience or imagination is challenging for the students. However, participants who were given the Cezanne painting as visual input are engaged design problem more than the others. Accordingly, sensual group spent more time to the project than second group. On the contrary, context development from the imagination may require high level of competence rather than sensual experience. First group was engaged with the design process through visual senses however the connection was not adequate to push the design process. A creative framework that can be understandable at each level need to be develop order to improve intuitive process of the individual.

In the sensual group two different approach is observed. C1 approach was more analytic while C2 approach was more intuitive. C1 and C2 both see different relations in the paintings but only C2 reinterpret them over and over again. Furthermore, she repeated the same reflection on model-making

process and create relations between parts and wholes. In functional group, F1 worked arbitrarily, while F2 try to demonstrate her idea very few elements. On contrary, F3 tried to create and ambience and use colour as a design element.

Additionally, the experiments were highly limited in terms of time, number of the students, materials and environment. The experiments can be repeated with more participants. Second group need to be re-evaluated without giving a character for an anonymous person and they need to push for more iteration for their action since first group used both sketch and model making as a design medium. The study can be further developed by adding other senses; such as touching, smelling, hearing, etc.

#### 4. Conclusion

In design education, it is important to engage the students' skill, knowledge and capacity with the design process. In this paper aesthetics experience is considered one of the linkage that engage students with the design process. Seeing is treated as a sensual experience and a case study was conducted in order to capture how design students can conduct design process through a visual experience and imagination. It is observed from the experiments context development either from the sensual experience or imagination is challenging for the 3<sup>rd</sup> year design students. However, participants who were given visual input were connected the process more straightforward. In most design curriculum, basic design courses mostly given at the first year and students are expected to gain knowledge how to employ different mediums in their design process. However, in the experiments without given a defined medium students were struggled to engage with the design process. In this sense, in order to improve intuitive process of the individual more defined frameworks are necessary and basic design education should employ throughout whole design education.

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## DECISION TREE APPROACH FOR PREDICTING STUDENTS' MATHEMATICS ACHIEVEMENT OF TIMSS STUDY

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### Abstract

Data mining has grown rapidly in many areas, especially in the field of education in recent years. Application of data mining techniques in educational domain is known as Educational Data Mining which is to discover hidden and useful knowledge from huge databases. The purpose of this study is to classify students according to their mathematics achievement and presenting it by a predictive data mining model using classification based algorithms. Dataset were obtained from Trends in International Mathematics and Science Study (TIMSS) 2011 for 8th grade Turkish students. Various classification algorithms in decision tree method such as J48, Random Forest, Random Tree, Rep Tree and Hoeffding Tree were compared in terms of their classification accuracy. Thus, the students were classified according to their mathematics performance and also the most important dimensions of classification algorithm were determined. Classification algorithms were implemented using WEKA an Open source tool. As a result, the best performing classification algorithm among all five classifiers has been obtained for these dataset.

*Keywords: Educational data mining, student's achievement, classification, decision tree, TIMSS.*

## 1. Introduction

Many studies have been focused on students' academic performance and factors that play an important role in achievement. In general, standard statistical procedures such as regression, multilevel modelling and factor analysis have been implemented in investigating students' achievement for national/international assessment studies. Despite several advantages, some limitations exist for these standard procedures. To give an example, one of the main assumptions of these procedures is the normality of data set. Also, these procedures require the linearity and variance homogeneity (Sinharay, 2016).

Data mining methods can overcome such limitations of standard statistical methods. Using data mining methods in the field of education has a special name, "educational data mining". Educational data mining (EDM) has been widely used in order to guides educators and education planners to discover hidden useful information. The main ideas of EDM were discussed in detail by Romero and Ventura (2007) and an extensive literature review was given for the period between 1995 and 2005. Also, in their study, Baker and Yacef (2009) pointed out different domains of EDM and addressed the studies related with these domains. Another important study deals with data mining applications in education was done by Pena-Ayala (2014). Despite several works, Sinharay (2016) drew attention that more works need to be done in order to investigate factors that affect the students' achievement. The purpose of this study is to classify students based on their mathematics achievement by using decision tree based algorithms. Besides finding the best performed decision tree based algorithm among J48, Random Forest, Random Tree, Rep Tree and Hoeffding Tree, the most important dimensions of classification are also outlined.

## 2. Methodology

### 2.1. Study Methods

Decision tree is the most popular data mining methods which can be used in both classification and prediction. A decision tree is a flowchart-like tree structure and classification rules can be easily extracted from generated tree (Han & Kamber, 2001). Important studies have been done in order to

investigate the academic achievement and its related factors by using decision tree algorithms [Cortez & Silva, 2008; Ramaswami & Bhaskaran, 2010; Alivernini, 2013; Abad & Lopez, 2016; Idil et al., 2016; Vialardi et al., 2011; Bilen et al., 2014; Baradwaj & Pal, 2011]. In this study, five widely used decision tree algorithms (J48, Random Forest, Random Tree, Rep Tree and Hoeffding Tree) are used and compared their classification performances in terms of classification accuracy based on several measures.

#### **J48**

J48 was first proposed by Quinlan in 1993 as a revised version of C4.5 algorithm. J48 generates trees using information gain and entropy and a pruning method is used to reduce the tree size while building a tree (Dangare & Apte, 2012).

#### **Random Forest**

RF can be simply described as a combination of tree-structured classifiers (Breiman, 2001). In this algorithm, a tree is trained on a subset of training samples and each tree generates a decision for classification. Votes are collected from trees and the classification which has the most votes is selected by the forests.

#### **Random Tree**

In this method, a random tree is built randomly from a set of possible trees. Accurate models can be obtained by using this algorithm because the combination of large sets of random trees can be generated efficiently (Zhao and Zhang, 2007).

#### **Hoeffding Tree**

This algorithm was first proposed by Domingos and Hulten (2000) and a pruning strategy is implemented by using Hoeffding bound while growing a tree. This algorithm is a type of very fast machine learning procedures (Gaber, 2012)

#### **Rep Tree**

To split the data, the gain information is used in the Rep Tree algorithm. A pruning strategy is implemented in order to reduce the error pruning (Turanoglu-Bekar et al., 2016).

The dataset is split in two parts (training set and test set); the system is trained by training sets and the performance evaluation is done by testing sets. In this study, a common technique called 10-fold cross validation (Stone, 1974) is used in order to assess the classification performance of algorithms. While searching the best performer algorithm, different performance measures are used in order to assess the classifiers. The measures used in this study are: Kappa statistics, Mean absolute error (MAE), True positive (TP) rate (sensitivity), F-measure, Matthews correlation coefficient (MCC) and the area of Receiver Operating Characteristic (ROC) curve.

## **2.2. Data set**

The data of the Trends in International Mathematics and Science Study (TIMSS) is used in this study. TIMSS has been conducted every four years and it is an international assessment study for the 4<sup>th</sup> and 8<sup>th</sup> grade students from 63 different nations. TIMSS study provides information about the effects of policy and practice in education system of each participating country (Mullis, Martin, Foy, & Arora, 2012). This study deals with TIMSS 2011 results for 8<sup>th</sup> grade Turkish students' mathematics results. The data set contains 6,928 students information. Some missing and inaccurate values are exist, so 678 students' data are excluded from the analysis.

Dependent variable is chosen as the first plausible value of mathematics test. If the score of a student is higher than the average 500, then the student is labeled as successful and the student's score is coded as 1. On the other hand, if the score of a student is lower than 500, then the student is in the non- successful group and related score is coded as 0. In order to find which factors are effective on mathematics achievement, nine survey questions are selected as potentially influencing factors. Thus, while the mathematics score is chosen as the dependent variable (classification is performed based on score), independent variables given in Table 1 are chosen as factors that affect the mathematics achievement.

## **2.3. Experimental setup**

Following steps are performed in order to take results: (Step 1) In the first step data set is prepared and factors are selected. (Step2) To assess the classification performances of five decision tree based algorithms, 10-fold cross validation is performed. In order to start the analyzing process, WEKA (Waikato Environment for Knowledge Analysis) software is used. Classification performances of algorithms are compared based on several measures given in Section (2.1). According to performance measures, the best classification algorithm is determined and ranked factors that are significant on mathematics achievement are reported.

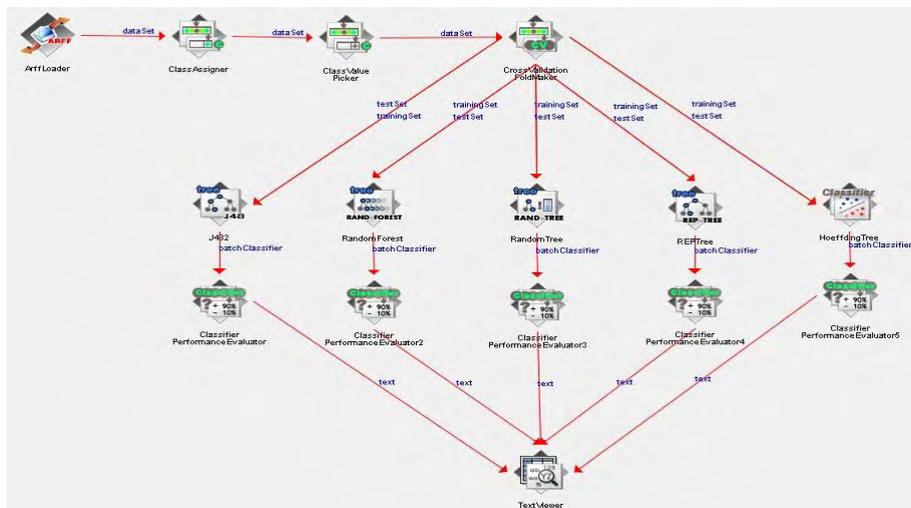
Table 1. Factors used in study.

| Factor name                                | Type of data         | Domain   |
|--|----------------------|--|
| SEX<br>(Student's gender)                  | Nominal              | 1: Female, 2: Male   |
| HER<br>(Home educational resources)        | 3 point likert scale | 1:Many resources,2:Some resources, 3: Few resources  |
| SB<br>(Students bullied)                   | 3 point likert scale | 1: Almost never, 2: About monthly, 3: About weekly   |
| SLL<br>(Students like learning)            | 3 point likert scale | 1: Like learning, 2: Somewhat like learning, 3: Don't like learning  |
| SVL<br>(Students value learning)           | 3 point likert scale | 1: Value, 2: Somewhat value, 3: Don't value  |
| SC<br>(Students confidence)                | 3 point likert scale | 1:Confident, 2:Somewhat confident, 3:Not confident   |
| SE<br>(Students engaged)                   | 3 point likert scale | 1: Engaged, 2: Somewhat engaged, 3: Not engaged  |
| HSS<br>(Number of home study supports)     | 3 point likert scale | 0: Neither own room nor internet connection, 1: Either own room or internet connection, 2: Both own room and internet connection                     |
| PHEL<br>(Parents' highest education level) | 5 point likert scale | 1: University or higher, 2: Post-secondary but not university, 3: Upper secondary, 4: Lower secondary, 5: Some primary, lower secondary or no school |

### 3. Results

WEKA Knowledge Flow tool is used to illustrate the experimental setup of this study and given with Figure 1. Also, the classification results according to performance measures for five decision tree algorithms are given in Table 2.

Figure 1. WEKA Knowledge Flow.



According to Table 2, J48 is the best performer algorithm in terms of TP rate, F-measure and MCC, which are 0.4774, 0.787, 0.776 and 0.490, respectively. In addition to comparison of different performance measures, the confusion matrix which shows the overall correct classification ratio for each algorithm is given with Table 3.

Table 2. Performance measures for all algorithms.

| Algorithm             | Performance Measures |        |         |           |       |       |
|-----------------------|----------------------|--------|---------|-----------|-------|-------|
|                       | Kappa                | MAE    | TP Rate | F-Measure | MCC   | ROC   |
| <b>J48</b>            | 0.4774               | 0.3063 | 0.787   | 0.776     | 0.490 | 0.781 |
| <b>Random Forest</b>  | 0.4129               | 0.3007 | 0.753   | 0.746     | 0.416 | 0.753 |
| <b>Random Tree</b>    | 0.4040               | 0.2966 | 0.754   | 0.744     | 0.411 | 0.713 |
| <b>Rep Tree</b>       | 0.4690               | 0.3030 | 0.786   | 0.773     | 0.487 | 0.797 |
| <b>Hoeffding Tree</b> | 0.4567               | 0.3301 | 0.786   | 0.768     | 0.486 | 0.720 |

Table 3. The confusion matrix for all algorithms.

| Classified as | J48  |      | Random Forest |      | Random Tree |      | Rep Tree |      | Hoeffding Tree |     |
|---------------|------|------|---------------|------|-------------|------|----------|------|----------------|-----|
|               | (a)  | (b)  | (a)           | (b)  | (a)         | (b)  | (a)      | (b)  | (a)            | (b) |
| <b>a = 0</b>  | 3835 | 374  | 3609          | 600  | 3686        | 523  | 3880     | 329  | 3962           | 247 |
| <b>b = 1</b>  | 957  | 1084 | 944           | 1097 | 1014        | 1027 | 1006     | 1035 | 1088           | 953 |

According to tables, the overall percent corrects in J48 algorithm is 78.04% and this value is higher than all other decision tree based algorithms. That means 78.6% data is correctly classified by using J48 and this algorithm outperforms the others in terms of all classification performance measures except two. Thus, it can be concluded that J48 should be preferred while classifying the students' mathematics achievement for this data set. The overall percent corrects for both Rep Tree and Hoeffding Tree are very close (nearly 78.64%) which means that these algorithms give similar results for their predictive ability. In addition, the worst algorithm in classification for this data set is random forest with the overall percent corrects of 75.296%.

While finding a subset of factors that produce the better classification, WEKA attribute selection method is used. Factors are sorted with respect to their discriminative power. Correlation Attribute Evaluator, Gain Ratio Attribute Evaluator and Info Gain Attribute Evaluator produce the same ordered results for all factors. Top five factors can be written as following: students' confidence, home educational resources, parents' highest education level, students like learning and number of home study supports. Among them, student's confidence is found the most important factor on mathematics achievement.

#### 4. Conclusion and discussion

In this study, classification performances of five decision tree based algorithms (J48, Random Forest, Random Tree, Rep Tree and Hoeffding Tree) are investigated in order to find the best algorithm for TIMSS 2011 results of 8<sup>th</sup> grade Turkish students' mathematics results. During the process of finding the best classifier, first of all, the dataset split into two sets namely training and testing and then 10-fold cross validation is performed. According to the performance measures, J48 is found the most appropriate algorithm. Besides, factors that play significant roles on mathematics achievement are extracted by using different attribute selection methods in WEKA. Correlation Attribute Evaluator, Gain Ratio Attribute Evaluator and Info Gain Attribute Evaluator produce the same ordered results for all factors. Students' confidence is found the most important factor on achievement and this result is consistent with the current literature [Liu & Meng, 2010; Hammouri, 2010]. To summarize, this study deals with two research questions: (1) which algorithm is the best in classification students' achievement? (2) which factors are important on 8<sup>th</sup> grade Turkish students' mathematics achievement.

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## CRUCIAL VARIABLES IN DEVELOPING A PROACTIVE ATTITUDE TO IMPROVE SOCIETY

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### Abstract

Learning gain is explored at a UK modern university through a survey designed to measure students' engagement with Active Citizenship. The survey contains three subscales: (1) Knowledge and awareness of different perspectives, (2) Actions taken within the community, and (3) Proactive attitude to improve society. These three dimensions of Active citizenship -cognitive, pragmatic and attitudinal, respectively- draws upon theoretical support from the European's Commission (1998) definition of Active Citizenship. A total of 923 students participated in the study. Results showed significant differences concerning gender and study dedication, but not for age. Discussion is provided around Active Citizenship as a challenging focus for engaging undergraduates in initiatives promoting leadership in a contemporary globalised context.

**Keywords:** *Active citizenship, gender, age, study dedication, higher education.*

### 1. Introduction

There is a growing interest in measuring learning gain in Higher Education, which can be defined as 'distance travelled' (HEFCE, 2015), that is, a measureable improvement in learners' knowledge, skills and competences demonstrated by students at two points in time. This tricky issue has been relatively under-explored in the UK (McGrath et al., 2015). It has been instead more thoroughly used in the US, but focused on the cognitive aspects, particularly critical thinking and written communication (e.g. the Collegiate Learning Assessment).

Learning gain is being explored at a modern university in the UK with a population of 20,000 students from a holistic point of view, that is, not only focused on cognitive aspects but also on procedural and attitudinal with the graduate attribute 'Active citizenship'. This attribute, together with four more -Academic literacy, Research literacy, Personal literacy and critical self-awareness and Digital literacy-, constitute an employability initiative in this British university that introduced these five graduate attributes into all taught programs in 2012. In other words, the graduate attributes were developed in order to define and create opportunities for students to develop the skills and attributes which would enable them to take up valuable and satisfying careers, and contribute to society and the economy.

The European Commission (1998) states that active citizenship most comprise not only the development of intercultural understanding (attitudinal level), but also the acquisition of operational competence (cognitive level) and both are best gained through practice and experience (pragmatic level). In this UK institution where the study takes place, the graduate attribute 'Active Citizenship' is defined as containing four core elements (see table 1).

*Table 1. Core elements in Active Citizenship.*

- 
- 1) Prepared to proactively engage with both local and global communities
  - 2) Knowledge of the local and global perspectives of one's discipline
  - 3) Critical awareness of the complexity of diverse perspectives, cultures and values and the ability to question one's own perspective and those of others
  - 4) Ability to use knowledge and skills to improve society through actively engaging with issues of equity, sustainability and social justice
- 

### 2. Objective

The objective of our research is to analyse students' cognitive, pragmatic and attitudinal engagement with Active Citizenship as a measure of learning gain. In specific, we want to see if

undergraduates show differences in relation to their gender, age (<40/ ≥40) and study dedication (full-time/ part-time).

### 3. Method

#### 3.1. Instrument development

The preliminary version of the instrument was under revision in November 2015 by four programme leaders and in December 2015 by a methodologist and an external advisor. After some amendments, a second version was under revision along February 2016 through cognitive interviews. These were conducted with 20 undergraduates from different areas in order to investigate how well questions perform when asked of survey respondents. Lastly, after some amendments the third version of the instrument was analysed by five judges in March 2016. Data from this pilot phase was conducted after receiving the ethical approval from the institution.

#### 3.2. Instrument

Our instrument measures learning gain in the graduate attribute ‘Active citizenship’. It comprises 15 statements rated on three Likert-type scales (Figure 1).

Figure 1. Dimensions of Active Citizenship.



From the total of 15 items -7 of them taken from the literature review-, three belong to the first dimension, eight to the second and four to the third (see Table 2).

Table 2. The Active citizen ship instrument.

|                   |  |
|-------------------|--|
| Cognitive level   | <ul style="list-style-type: none"> <li>- Becoming aware that understanding of your subject may vary depending on local contexts and culture</li> <li>- Understanding people of other backgrounds (economic, racial/ethnic, political, religious, nationality etc.) (*)</li> </ul>  |
| Pragmatic level   | <ul style="list-style-type: none"> <li>- Worked with students from other cultures and/or backgrounds e.g. in groupwork, team projects in order to learn from other points of view</li> <li>- Participated, as part of your course, in activities/projects which engage with the community</li> <li>- Doing volunteer work (*)</li> <li>- Participating in extra-curricular or co-curricular activities (societies, sports, etc. via the institution or the students' union)</li> <li>- Gained work experience in a paid or unpaid role e.g. an internship, field experience or placement (*)</li> <li>- Contributed to your programme of study in a paid or unpaid role e.g. as a module assistant, research assistant, e-pioneer or peer assisted learning mentor etc. (*)</li> <li>- Hold a formal role within the university e.g. as a chair of a departmental or student society, or as a student ambassador (*)</li> <li>- Participate in a study abroad programme (*)</li> <li>- Participate as a volunteer at Brookes or the wider community (*)</li> </ul> |
| Attitudinal level | <ul style="list-style-type: none"> <li>- Adopting a responsible and ethical position within your chosen profession or discipline</li> <li>- Becoming motivated to make a positive contribution in your community even if it is at a small level</li> <li>- Developing a proactive attitude/"positive spirit" to improve society</li> <li>- Engaging with ideas of equality, sustainability or social justice</li> </ul>  |

Note. Items ranged from 1 to 4

Note. (\*) pre-existing items drawn from work by Sharpe et al. (2014)

Information on some socio-demographic background variables was also collected, covering the participants' gender, age, native language, course, year of study, country of origin, previous studies and/or work experience, and principal source of income during this year.

## 4. Data

### 4.1. Participants

The participants were 923 undergraduates studying their course in the departments of Business, Health Life Sciences, Human & Social Sciences and Technology, Design & Environment from a British university. Students in their last year were excluded of the study since they were already required to fill out another survey for another study.

### 4.2. Data collection

Our survey questions were inserted into the bi-annual Student Engagement Survey conducted by the university of our study. Undergraduates received a web link through e-mail that redirected them to the survey. Their voluntary participation was requested and the confidentiality of their data was assured. Data was collected from 10th April to 13th May 2016 with a response rate of 13%, providing a confidence interval of +/-3%.

### 4.3. Statistical analysis

Mean, Median and Variance were measured with the SPSS software, as well as significant differences ( $p$ ) concerning gender, age and study dedication.

## 5. Results and Discussion

### 5.1. Results

It is important to remind that we are measuring *perceptions* of learning gain on the area of Active Citizenship rather than learning gain itself. This brings us the opportunity to check students' satisfaction with the instruction received and therefore reflect on the role of the institution concerning the attribute Active Citizenship as part of their employability initiative.

Males show higher satisfaction with the knowledge and awareness of different perspectives/cultures/values provided by the institution. Moreover, males slightly take more actions within the community (in class, extra-curricular and co-curricular activities, volunteer work). Furthermore, males show a slightly higher satisfaction with the institution in its role to promote a proactive attitude to improve society (see Table 3).

Table 3. Gender differences in Active Citizenship perceptions.

|        |          | Cognitive dimension | Pragmatic dimension | Attitudinal dimension |
|--------|----------|---------------------|---------------------|-----------------------|
| Male   | Mean     | 2.22                | 2.50                | 2.47                  |
|        | Median   | 2.16                | 2.50                | 2.50                  |
|        | Variance | 0.58                | .16                 | .62                   |
| Female | Mean     | 1.96                | 2.43                | 2.32                  |
|        | Median   | 1.66                | 2.50                | 2.25                  |
|        | Variance | .52                 | .13                 | .60                   |
| $p$    |          | .000                | .008                | .013                  |

There is not a significant difference between the age groups and the Cognitive, Pragmatic and Attitude dimensions of Active citizenship. In other words, age doesn't affect in the level of satisfaction with the knowledge and awareness of different perspectives provided by the institution nor its role to promote a proactive attitude among students to improve society. It also doesn't affect in the actions taken by them (see Table 4).

Table 4. Age differences in Active Citizenship perceptions.

|     |          | Cognitive dimension | Pragmatic dimension | Attitudinal dimension |
|-----|----------|---------------------|---------------------|-----------------------|
| <40 | Mean     | 2.04                | 2.45                | 2.38                  |
|     | Median   | 2.00                | 2.50                | 2.25                  |
|     | Variance | 0.55                | .14                 | .61                   |
| ≥40 | Mean     | 2.21                | 2.36                | 2.23                  |
|     | Median   | 2.33                | 2.37                | 2.50                  |
|     | Variance | .64                 | .09                 | .68                   |
| $p$ |          | .351                | .224                | .435                  |

To finish, part-time students show higher satisfaction with the knowledge and awareness of different perspectives/ cultures/ values provided by the institution (see Table 5).

Table 5. Study dedication differences in Active Citizenship perceptions.

|           |          | Cognitive dimension | Pragmatic dimension | Attitudinal dimension |
|-----------|----------|---------------------|---------------------|-----------------------|
| Full-time | Mean     | 2.04                | 2.45                | 2.37                  |
|           | Median   | 2.00                | 2.50                | 2.25                  |
|           | Variance | 0.54                | .14                 | .60                   |
| Part-time | Mean     | 2.53                | 2.43                | 2.66                  |
|           | Median   | 2.66                | 2.43                | 2.75                  |
|           | Variance | .79                 | .08                 | 1.16                  |
| <i>p</i>  |          | .021                | .657                | .191                  |

## 5.2. Discussion

Our data can be helpful in order to take future decisions around how to work better the attribute Active Citizenship in the curriculum in Higher education. Especially concerning the variable Study dedication, a reflection that emerge from our study is that the more opportunities and chances students have to establish links outside university along their studies, the more they will take benefit of the graduate attribute Active Citizenship established by the university as an employability initiative.

Males showing higher satisfaction with the institution in respect to the graduate attribute measured may be explained since females are in turn more demanding and critical with the training they receive. This could be related with perfectionism and there is literature in the field of Educational psychology indeed that supports female students being more perfectionist than males. In any case, it calls the attention in specific the second result concerning the actions taken within the community. Perhaps if we were analysing specific actions instead of having measured them in a global way, we would find that females take more actions in specific tasks (like for example volunteer work). Further analysis should check this.

Satisfaction with the institution concerning the graduate attribute of Active Citizenship is not related with age. In other words, we do not find any tendency on younger students or more mature students on their satisfaction with the training received on this aspect. On the other hand, it is shown that age doesn't affect in the involvement/actions that students take as active citizens. This specially calls the attention since normally mature students have additional responsibilities of work, family, etc., but it seems that this doesn't stop them in being less proactive with the community.

Concerning study dedication, part-time students generally receive a training with some peculiarities: condensed contents and a lot of times online learning. It would be interesting to check their overall satisfaction with the instruction received in comparison with full-time students and see if a higher satisfaction with the institution in the graduate attribute of Active citizenship is just (or not) an indicator of an overall better perception of the quality in the training received. Another hypothesis is that since part-time students are generally working, maybe the inputs that they receive in their professional field help/enrich them to make more significant connections with the knowledge and awareness of different perspectives/ cultures/ values provided by the university, showing therefore more appreciation on this issue and therefore more satisfaction.

## 6. Significance of the research

Our research is a first step in supporting the higher educational goals of encouraging alumni to be active citizens, and has ramifications for the sector as a whole where employability is growing in importance, and employers are increasingly seeking ethical and social engagement.

The innovative nature of this research is the application of learning gain theory to the study of students' professional development. In practice, this means further embedding Active Citizenship into all taught courses at all levels (Foundation, UG, and Taught PG). In that sense, our work constitutes a first approach in the line of promoting students to be leaders in the contemporary globalised context which they belong. Future research should promote the development and dissemination of discipline-linked resources on active citizenship, shared through sector wide events and university websites.

Another innovation of the research is the collection of data from the students' perspectives in the topic of learning gain. In other words, the research reported here gives a voice to students themselves in the learning gain debate, which is a surprisingly rare undertaking. This implies, as it was said, collecting students' perceptions of learning gain and not learning gain itself. With this approach, students' satisfaction towards their institution conforms an interesting and useful element that, from our point of view, should be considered when taking curricular decisions.

To finish, we believe that our work can call the attention of a diverse audience -higher education practitioners, researchers in learning gain and educators for sustainability- interested in the internationalisation of the curriculum at university, which involves providing students with global perspectives of their discipline, giving them a broader knowledge base for their future careers and helping them to develop a set of values and skills to operate in diverse cultural environments (HEA, 2014).

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## COMPARING DATA MINING METHODS FOR CLASSIFICATION OF STUDENTS' SCIENCE SUCCESS

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### Abstract

Data mining in the field of education has increased its attention due to enable researchers to overcome some limitations of traditional statistical methods. In order to provide solutions to defective strategies, construct the correct student-based model is a vital purpose of improving managerial decisions. Especially, the outputs obtained from Trends in International Mathematics and Science Study (TIMSS) give comprehensive information about students' performance on mathematics and science at the international level. In this study, classification performances of REPTree, Naïve Bayes and Logistic Regression are compared in order to identify the features that influence the science achievement statistically. For this purpose, TIMSS 2011 data of Turkish 8th grade students are used and two research questions are taken into account (1) which algorithm has the best performance on classification? (2) which features are statistically significant on science achievement?

**Keywords:** *Educational data mining, science achievement, classification performance, TIMSS.*

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### 1. Introduction

For both educators and educational policy makers, it is needed to identify the current defective strategies. In order to provide reliable solutions to these defectives, constructing the correct student-based models is of vital importance. With the help of the correct student-based models, students' achievement in the near future can be predicted by using the current information.

One of the main steps of constructing the correct model is determining factors that play important roles on student's academic achievement. There is an extensive literature on investigating factors that significantly affect the academic achievement of students. To give an example, Papanastasiou (2000) and Woessmann (2003) investigate the impact of school resources such as class size and curriculum content. On the other hand, important studies deal with teachers' characteristics show that some factors such as education level and teaching experience impact the students' achievement significantly [Hanushek & Luque, (2003); Jürges & Schneider, 2004]. Besides, age, gender and family background can be called as students' characteristics and important studies have been done in order to find a relation between these factors and academic achievement [Fredricks, Blumenfeld, & Paris (2004); Liu & Meng (2010); Hammouri (2010); Askin & Gokalp (2013); Woessmann, 2005].

The aim of this study is finding the best model that classifies the students' achievement correctly. For this purpose, three widely used educational data mining (EDM) methods such as REPTree, Naïve Bayes and Logistic Regression are performed. The best performing method is chosen based on different statistical performance measures. After that, significant factors on achievement are determined by using correlation attribute evaluator. WEKA (Waikato Environment for Knowledge Analysis) software which includes several machine learning algorithms is used for the analysis. The data set used in this study is the science results of Trends in International Mathematics and Science Study (TIMSS) for the 8<sup>th</sup> grade Turkish students.

The remainder of this study is organized as follows: Section 2 provides the methodology of this study. Section 3 includes results and finally a brief conclusion is given in Section 4.

## 2. Methodology

### 2.1. Study Methods

EDM has been growing rapidly in the educational studies. The studies of Romero and Ventura (2007), Baker and Yacef (2009) and Pena-Ayala (2014) pointed out the importance of using data mining methods in educational field. With the help of the using data mining methods, understanding and analyzing the huge data sets, which is one of the biggest challenges facing the researchers, becomes easier than using standard statistical procedures. As it is known, standard statistical procedures have some limitations such as requiring the linearity, variance homogeneity and normality (Sinharay, 2016). Data mining methods can overcome such limitations. In this study, three different data mining methods that are widely used in EDM studies are chosen. A brief descriptions of methods are given following.

#### RepTree

A decision tree can be used in both classification and prediction and it is a flowchart-like tree structure (Han & Kamber, 2001). Different decision tree algorithms were proposed and REPTree is used for this study. REPTree is based on a decision and regression tree. To split the data, the gain information is used and a pruning strategy is implemented in order to reduce the error pruning (Zhao and Zhang, 2007; Turanoglu-Bekar et al., 2016).

#### Naïve Bayes

Naïve Bayes (NB) is a Bayesian network algorithm and it has two assumptions which need to be met. The first assumption is factors should be conditionally independent with respect to class. The second one is the assumption related with hidden factors. It is assumed that factors that affected the dependent variable should be observable or measurable, in other words not hidden. It is a classification algorithm for binary and multinomial model. NB can be used either maximum likelihood method or maximum a posteriori method for parameter estimation.

#### Logistic Regression

Logistic regression (LR) measures the relationship between binary or multinomial dependent variable and factors (independent variables) with using a logistic function. When dependent variable  $Y$  takes the value of 0 or 1, binary logistic regression is used in order to predict the dependent variable from factors. The simplest binary logistic regression model can be written as following:

$$\pi(x) = \frac{e^{x\beta}}{1 + e^{x\beta}} = \frac{1}{1 + e^{-x\beta}} \quad (1)$$

In Model (1),  $\pi(x)$  is the probability of outcome of interest and  $\beta$  is a vector of  $k$  regression parameters. A logit transformation is applied in order to convert the model from nonlinear to linear form. After that the unknown regression parameters are estimated via maximum likelihood estimation method (Hosmer & Lemeshow, 2000).

### 2.2. Real data set

TIMSS is an international assessment study and it has been conducted every four years. The study deals with the achievement in mathematics and science for the students at 4<sup>th</sup> and 8<sup>th</sup> grade. In 2011, 63 countries with more than 600,000 participants are included. TIMSS is the largest and reliable international survey study which provides a better understanding of current educational system to each participant country (Mullis, Martin, Foy, & Arora, 2012). In this study, the science achievement of 8<sup>th</sup> grade Turkish students' (age between 12 and 16) is taken into account and missing values are excluded from the analysis. Dependent variable (score of the test) is the first plausible value of science test. Due to average score of TIMSS was calculated as 500, a student who has a score above 500 is labeled as successful and a student who has a score below 500 is labeled as unsuccessful. So, if a student is in the successful group, than his/her score is encoded as  $y=1$ , otherwise  $y=0$ . Table 1 gives the descriptions and some descriptive statistics for the factors according to two groups. As it is seen, eleven factors are selected as potentially influencing the science achievement and while 2813 students get the score above 500, 3501 students get the score below 500.

### 2.3. Steps of analyze

WEKA (Waikato Environment for Knowledge Analysis) software is used in this study. First of all, the data set is purified from the missing and inaccurate values. While performing the RepTree, naïve Bayes and logistic regression, the dataset split in two parts (training set and test set) and the system is trained by training sets. Performance evaluation of three methods is done by testing sets and a common technique called 10-fold cross validation is used (Stone, 1974). To compare three methods in terms of

their classification accuracies, several performance measures such as true positive (TP) rate, precision, F-measure, Matthews correlation coefficient (MCC), Receiver Operating Characteristic (ROC) area and precision-recall curve (PRC) area is computed. According to the performance measures, the best performer classification method is determined and the factors that significantly affect the science achievement are chosen by using WEKA correlation attribute evaluator.

Table 1. Descriptive statistics of factors.

| Variable                              | Description          | Above 500<br>mean± std.dev | Below 500<br>mean± std.dev |
|---------------------------------------|----------------------|----------------------------|----------------------------|
| Gender                                | Nominal scale        | 1.478±0.499                | 1.508±0.500                |
| Home educational resources            | 3 point likert scale | 2.318±0.607                | 2.655±0.493                |
| Students bullied at school            | 3 point likert scale | 1.533±0.671                | 1.692±0.764                |
| Students like learning science        | 3 point likert scale | 1.475±0.646                | 1.724±0.691                |
| Students value learning science       | 3 point likert scale | 1.729±0.781                | 1.901±0.794                |
| Students confidence with science      | 3 point likert scale | 1.755±0.704                | 2.205±0.665                |
| Students engaged in science           | 3 point likert scale | 1.622±0.642                | 1.892±0.648                |
| Number of home study supports         | 3 point likert scale | 1.190±0.785                | 0.864±0.778                |
| Parents' highest education level      | 5 point likert scale | 3.511±1.411                | 4.249±1.032                |
| Weekly spent time on science homework | 3 point likert scale | 2.473±0.621                | 2.417±0.649                |
| <b>Total</b>                          |                      | <b>n=2813</b>              | <b>n=3501</b>              |

### 3. Results

Results are given in Table 2. As it is seen in Table, LR appears to be preferred model choice for this data set according to all performance measures. LR has the highest TP rate with 0.687, which means that 68.7% data is correctly classified with LR. It also can be said that NB and LR give similar results in terms of F-measure but in all criteria except this, LR has the highest values of measures when compare with NB.

Table 2. Performance measures of methods.

|          | Class         | TP Rate      | Precision    | F-Measure    | MCC          | ROC Area     | PRC Area     |
|----------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Rep Tree | 0             | 0.769        | 0.680        | 0.722        | 0.328        | 0.720        | 0.730        |
|          | 1             | 0.550        | 0.657        | 0.598        | 0.328        | 0.720        | 0.659        |
|          | Weighted Avg. | 0.671        | 0.670        | 0.667        | 0.328        | 0.720        | 0.698        |
| NB       | 0             | 0.743        | 0.706        | 0.724        | 0.361        | 0.742        | 0.757        |
|          | 1             | 0.615        | 0.658        | 0.636        | 0.361        | 0.742        | 0.707        |
|          | Weighted Avg. | 0.686        | 0.685        | 0.685        | 0.361        | 0.742        | 0.735        |
| LR       | 0             | 0.763        | 0.700        | 0.730        | 0.362        | 0.745        | 0.761        |
|          | 1             | 0.593        | 0.668        | 0.628        | 0.362        | 0.745        | 0.713        |
|          | Weighted Avg. | <b>0.687</b> | <b>0.686</b> | <b>0.685</b> | <b>0.362</b> | <b>0.745</b> | <b>0.739</b> |

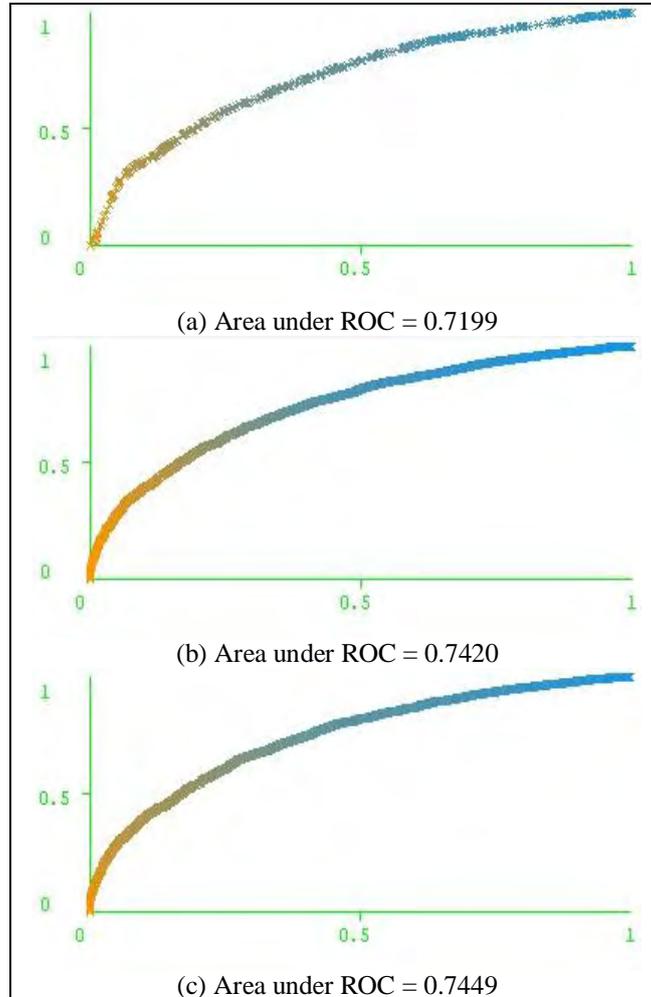
ROC curve which is an illustration of how a classifier performed (Bradley, 1997) is also given for each method by Figure 1. ROC curve is drawn by using TP rate (on the Y-axis) and 1-TN rate (on the X-axis). As seen in Figure 1, the ROC area in LR is higher (with a value of 0.7449) in comparison with RepTree and NB.

Besides, a subset of factors that produce a better classification performance is found by using WEKA correlation attribute evaluator. This procedure is done by sorting factors with respect to their discriminative power. Table 3 gives the obtained results. As it is seen, top five factors that significantly impact the students' science achievement can be written as: "students engaged in science", "students bullied at school", "weekly spent time on science homework", "number of home study supports" and "parents' highest education level". Among them, "Students engaged in science" is found the most effective factor on science achievement for this data set.

Table 3. Top performing 5 factors.

| Rank | Value  | Description                           |
|------|--------|---------------------------------------|
| 1    | 0.3116 | Students engaged in science           |
| 2    | 0.2920 | Students bullied at school            |
| 3    | 0.2896 | Weekly spent time on science homework |
| 4    | 0.2035 | Number of home study supports         |
| 5    | 2029   | Parents' highest education level      |

Figure 1. ROC curves for (a) REPTree (b) Naïve Bayes (c) Logistic Regression.



#### 4. Conclusion and discussion

This study aims to fill in the gap in the current literature by applying different data mining methods to the TIMSS-2011 science results which is the last released dataset. For this purpose, three widely used data mining methods namely RepTree, naïve Bayes and logistic regression are used and classification performances of these methods are compared based on several performance measures. Results show that the best classification method among them is logistic regression. Besides, five top factors are found significant on explaining the 8<sup>th</sup> grade Turkish students' science achievement. "Students engaged in science" is found the most effective factor.

In conclusion, this research could provide important information for Turkish students' science achievement. During the construction of effective action planning, identifying factors that affect the students' achievement should be an important research question by education planners. To improve the quality of education, education planners should be (1) construct the correct student-based model (2) determine the component of academic achievement and (3) provide solutions to defective strategies.

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## **SUPPORTING STEM TEACHERS' LEARNING: LESSONS FROM A NEWLY ESTABLISHED SCHOOL IN THE MIDDLE EAST**

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### **Abstract**

Prioritizing initiatives and support for teachers of science, technology, and mathematics in international schools can be a complex and difficult decision. The demands of teaching in these schools can be equally complex as teachers are often faced with a myriad of challenges that include, but are not limited to, assimilating into a new culture, emulating the norms of their new school, and re-defining their own identity as a teacher within these new contexts. Furthermore, the confluence of these issues become more pronounced within new schools as the mission, vision, and overall identity of the school is often still in flux. This paper examines a multi-year collaborative project between a new international school in the Middle East and a university-based professional development team in providing comprehensive and scaffolded support to teachers in order to create rich learning experiences for students within technical content areas. Findings highlight some of the more prominent benefits for the teachers and common challenges in developing the internal capacity for professional growth.

**Keywords:** *STEM Education, Teacher Development, Middle East, New Schools.*

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### **1. Introduction**

International schools provide amazing opportunities for students from varied cultures, ethnicities, and nationalities to study and learn from each other and learn firsthand what it means to be a global citizen. However, physical, logistical, and philosophical constructs within the school must first be realized for these opportunities to effectively leveraged. Additionally, prioritizing initiatives and providing support for teachers of science, technology, and mathematics in international schools can be a complex and difficult process. Supporting teachers within these contexts is more dynamic and complex than is often realized, especially in newly established schools. Retention of highly qualified educators is constantly a challenge, and in some regions such as the Middle East, these challenges can be compounded by the rapid growth of student populations and thus a sharp increase in the number of new schools being created (Knowledge & Human Development Authority, 2014). While there are multiple challenges that are worthy of consideration, this paper focuses specifically on the broader organizational and philosophical aspects of newly established schools, teacher development challenges, and mathematics and technology content specific considerations for one primary through secondary school in the Middle East.

Schools are multi-faceted institutions aimed at providing the best learning opportunities possible to students. However, for newly established international schools, a myriad of organizational and philosophical issues need to be addressed prior to opening their doors to students. Three of these issues deal with organizational structures, school identity, and managing competing priorities.

#### **1.1. Common Challenges for Newly Established Schools**

The organizational structures of newly established international schools has an impact on the nature and quality of support provided to teachers. One of the more impactful aspects of this structure deals with the identification and deliberate hiring of key positions and the assigning of specific responsibilities to these positions. This means understanding the kinds of expertise needed to support the mission and vision of the school. For schools that have a primary focus on technical content areas such as science, technology, engineering, and mathematics (STEM), this also means having a clear understanding of what it means to be a STEM school, clearly articulating this plan to all stakeholders, and implementing this plan across grade levels. In addition, the school should know what technologies, tools, curricular resources, and pedagogical constructs will be the most helpful in realizing the school's goals. This all suggest a need for a clear organizational structure with specific expertise in place, but newly established schools often lack the institutional knowledge needed to carry this out (Chen, 1993).

Due to the short length of time in existence with personnel who are hired from across the world, multiple and competing priorities can surface which can inhibit timely implementation of the school's plans. Essentially, when schools are developing policies, routines and norms for the first time, a type of institutional survival exists that can inhibit the development of an effective culture and positive climate needed to properly run the school. In turn, this struggle between identifying and purposefully structuring key personnel, prioritizing critical action items, and trying to establish a positive school culture and climate for teaching, operational and institutional norms can be counterproductive to the mission and vision of the school resulting in a de facto school identity that can make supporting STEM teachers problematic.

## **1.2. Common Challenges in Supporting Teachers**

Even if the previous organizational and philosophical aspects are well developed, there are additional challenges in providing personal and professional support to teachers. Two of the more important include emulating the intended instructional and professional norms of the new school and providing professional development opportunities that are focused, timely, and relevant for personal professional growth as well as institutional growth.

Emulating the intended instructional norms can mean adopting new professional practices, which often means shifting instructional paradigms. Learning to integrate past professional experiences with new contexts depends greatly on the support provided by the school's leadership as well as official or unofficial mentors. However, as previously stated, these support structures may not be evident or may be underdeveloped. Providing timely and relevant professional development is a critical component to supporting teachers' professional growth and helping them adapt to the professional norms within the school. Much of the current research on professional development indicates that it consists of several key factors that mutually support and build upon each other. Specifically, effective professional development should be on-going, embedded within a classroom context, and collaborative in nature (Desimone, 2009; Guskey 2002).

Finally, the accessibility of the professional development can also be problematic for many international schools as they often have limited access to human or intellectual resources. Consultants or other professional development support centers which might be found in relevant higher education institutions may not be present in the local community. Thus, the nature and complexity of the professional development may also be limited and incongruous with the school's intended outcomes around professional development.

## **1.3. Challenges in STEM Education**

Supporting teachers in technical content areas of STEM provides its own unique challenges. For teachers of mathematics, teaching for conceptual understanding is critical if students are to learn how to be productive problem solvers who can persist despite facing challenging mathematical contexts. Since teaching for conceptual understanding means creating learning experiences that go beyond just addressing content standards, a fundamental shift in instructional practices is equally important (Conference Board of the Mathematical Sciences, 2012; National Council of Teachers of Mathematics [NCTM], 2014). The teaching and learning of discrete mathematical skills does little to help students understand how to apply these skills or recognize when these skills are needed. Kilpatrick, Swafford, & Findell (2001) call on the development of procedural fluency through conceptual understanding but this implies that teachers understand how to create rich mathematical learning environments. In order to effectively realize the instructional shifts in key teaching practices, teachers must also get support from leaders in authentic and organic learning contexts. This means creating and sustaining meaningful opportunities for teachers to explore key mathematical concepts, techniques for understanding these concepts in students' thinking, as well as opportunities to reflect on and discuss episodes of their teaching and formative evidence of student learning.

As with the teaching of mathematics, understanding how to meaningfully integrate technology into learning experiences remains elusive for many teachers. Even as most inservice teachers agree that technology can support specific teaching and learning tasks, many remain skeptical of technology's value in classrooms settings, with others also doubting their ability to successfully integrate technology into their teaching. In fact, teachers' perceptions of technology directly impact their willingness to integrate it into their teaching (Koh, Kin, Wadhwa, & Lin, 2012). Simply providing technology without scaffolding integration can result in anxiety among some teachers, which can then manifests as resistance (Ertmer, 2005). However, these issues and other barriers to technology integration can be mitigated, or improved, via scaffolded professional development opportunities (Kenny & McDaniel, 2011).

As such, supporting the professional growth of educators in STEM areas needs special consideration, especially considering the challenges facing newly established schools. Keeping these issues in mind, this paper examines a multi-year collaborative project between a new international school in the Middle East and a university-based professional development team in providing comprehensive and scaffolded support to STEM teachers.

## 2. Design

The purpose of this multi-year qualitative study was to better understand the challenges facing one newly established international school in supporting mathematics and technology teachers in creating rich learning experiences for students. This study used a grounded theoretical approach (Corbin & Strauss, 2007) to allow for the development of understandings based on multiple qualitative data sources. While this project is ongoing, the data and findings in this paper are only from the first two years of the project.

### 2.1. Methodology

This study used a qualitative approach as it allowed for flexible, open, and multiple interpretations. Field notes from classroom observations and other teacher interactions, along with semi-structured interviews and open-ended questionnaires were used to develop understandings related to supporting STEM teachers in this newly developed school. Emphasis was placed on the interpretations and meaning that the researchers and the teachers had towards feeling supported in creating rich learning experiences in mathematics or when integrating technology. Data were read and reread by the research team to identify and confirm the key themes (Patton, 2002).

### 2.2. Participants

All participants were employed at the same preschool through grade 12 American curriculum school in a small Middle Eastern country. At the start of this study, the school had only been in existence for one full academic year but was quickly growing its professional teaching staff and student population. Participants included 68 primary and secondary teachers ( $n = 52$  and  $n = 16$ , respectively) and 10 school leaders (i.e. principals, heads of school, and academic coaches). All teachers had a minimum of 5 years of experience, with the median years teaching being 10 years. The maximum number of years teaching was 32. Additionally, all teachers held an education degree from an accredited university.

### 2.3. Limitations

As with all qualitative studies, the findings from this study are not broadly generalizable. It is left to others to determine the extent to which this study aligns with other cases or contexts. However, given the rapid increase in new schools, especially within the Middle East, it is possible that understandings from this study may be applied to other relevant or similar contexts wherein further insights can be developed (Patton, 2002).

## 3. Findings

The findings are based on the field notes from observations, semi-structured interviews, and open-form responses from questionnaires. From the analysis of this data, several themes emerged. For the sake of this paper, only two of the more prominent themes are shared. These two themes focus on a clear and cohesive strategic plans for instruction that is understood by all relevant parties and the need for more dynamic and context-based professional development grounded in classrooms with students.

### 3.1. Instructional Strategic Plan Vision

Frequently, teachers talked about the work they would do within their own classrooms, but there was rarely any understanding across classrooms as to core instructional practices that were valued. That is, teachers would talk specifically about what they did for students within their own classroom, as in the kinds of activities they might provide or a general description of the purpose of these activities, but they did not seem to know how their own instructional and pedagogical beliefs aligned with their colleagues' actions even within the same grade. For example, topics such as "hands on learning" and "infusing technology" and "math discussions" were often reference but the reasons why such pedagogical moves were used, or the specific learning outcomes intended from these topics, was not clear. Essentially, the teachers shared a common language around what they did but not a shared instructional vision as to why they made these instructional choices.

In mathematics classrooms, nearly every teacher indicated that having students talk about mathematics was important to students' learning. However, the nature of these discussions were often teacher initiated, teacher led, and seemed to focus on obtaining computational results. Student responses to questions were short, often factual, and lacked the depth of reasoning and justification needed to develop conceptual understanding. Instead of as such, teachers often agreed about what they were doing but the classroom observations revealed a drastically different representation and this created an unintentional but incongruous vision around the nature of teaching and learning. School leaders were somewhat aware of these issues but did not have available the support systems, policies or procedures to

provide systematic follow up to these teachers or a concerted process by which issues of this nature could be openly discussed or addressed. Another example involved how technology was being used. Rather than using technology as an integrated tool for creating student-centric learning environments, many teachers were using it primarily as a teacher productivity tool, with various technology tools often employed as static, teacher-centric tools rather being placed in the hands of students.

As a result of this lack of shared vision and understanding for how to integrate various learning tools or instructional strategies, teachers did not always purposefully, and collectively work, on improving the learning opportunities for students. They would be engaged during the workshops or training sessions, but many did not actively attempt to develop their practice outside of the designated professional development days because they knew there would be little follow-up until the next visit from the university professional development team. Essentially, there was a lack of infrastructure and professional support systems in place within the school and within the region. The result was pockets of professional growth or stagnation depending upon the internal leadership of grade-level teams or content departments.

### **3.2. Classroom-Based Professional Development**

After the first two school-based visits, it became clear during classroom observations and discussions with teachers that changes in professional practice were not happening in an expedient or uniform manner. AS such, the nature of the support changed to more classroom-based professional development. This included modeling teaching practices, co-planning and co-teaching lessons, and otherwise providing more “coaching” support than traditional professional development opportunities. As a result, teachers were willing to implement and practice teaching strategies immediately, felt that their grade-level or content teams was a strong advocate for them, and provided access to professional learning experiences that were otherwise difficult to secure within the region.

Findings also suggest that school leaders cannot assume that teachers will figure out for themselves how their own instructional and pedagogical beliefs aligned with that of the school or even with grade level colleagues. Nor can it be assumed that they will understand why it is important to work toward alignment. Instead, this process of discovery and alignment needs to be scaffolded for teachers. Awareness of these concerns alone is not enough. Instead, new schools need to develop both an infrastructure and support systems, including policies or procedures aimed at providing systematic follow up to address confusion or a concerted process by which issues of this nature can be openly discussed or addressed.

## **4. Discussion**

School and university partnerships are critical in supporting ongoing job-embedded professional development structures (Darling-Hammond et al., 2009) but well written strategic plans, with measureable outcomes, that are shared and understood by all parties are critical to the individual and collective professional growth of teachers. Supporting teachers beyond traditional workshop models is necessary in further developing their professional beliefs, dispositions, and instructional practices but this means closely attending to classroom and/or individual, as well as school-wide, challenges.

First, teachers and school leaders should collaborate to develop specific short term and long term goals. Support from experts outside of the school can help provide unbiased insight into the process. One of the primary goals should focus on aligning teachers' instructional efforts to meet the institution's mission and vision in STEM education. Again, clearly understanding what it means to be a STEM school is needed early on so that future efforts can support the collective and individual professional development of the teaching faculty. Expect and allow teachers to appropriately struggle with new information. Conversely, help teachers see the value of this struggle for the students they teach.

Next, systems of support that go beyond grade level or departmental meetings, and that focus on providing collaborative and critical analysis of instructional practices, should happen as soon as possible. These kinds of ongoing professional development might include such things as Lesson Study (Lewis, Perry, & Murata, 2006) type experiences wherein deliberate conversations around instruction and formative assessments, not curriculum, co-teaching opportunities, and academic coaching support. These kinds of support not only encourage teachers to be more purposeful and deliberate in their practice through focused and collaborative reflection, but also create structures for critical analysis of student learning. Given the need to also develop discipline specific habits of mind in technical STEM content areas in students, a challenging and dynamic process in itself, collaborative and non-evaluative structures for examining teachers practice are necessary.

Specific to the teaching and learning of mathematics, emphasis should be placed on developing students' flexible thinking with mathematical concepts and evidence of this reasoning should be visible/audible during all aspects of learning. Students should be actively engaged in problem solving experiences with opportunities to develop, defend, and critique mathematical arguments but teachers often struggle to understand how to facilitate dynamic learning contexts of this nature (NCTM, 2014).

Likewise, administrators, coaches, and other relevant teacher leaders should have a clear and well developed understanding of what constitutes effective mathematics instruction and be able to attend to specific evidence of student learning, during instructional moments and not just using summative or “benchmark” data. With this understanding comes the ability to facilitate more focused and contextual professional development support for individual teachers.

For technology, substantial time and energy focused on modeling the use of technology (i.e., hardware and/or software) to support inquiry learning, particularly for those teachers who are struggling to make the shift to less teacher-centric methods of teaching, is vital. This should include identifying technology teacher leaders who can help teachers recognize ways to facilitate learning via the use of problem solving, inquiry, and creative expression in a multitude of STEM classes. Finally, allow teachers opportunities to identify and share examples from their own practice is useful as this helps to develop the internal capacity of professional development; teachers are the ones leading and shaping the nature of support provided.

## 5. Conclusion

As demonstrated by the lessons learned by one newly established school in the Middle East, prioritizing initiatives and support for STEM teachers can be a complex and difficult process, but the results of these efforts can help teachers coalesce practices and beliefs to create a shared mission, vision, and overall school identity. Additionally, developing the internal capacity of teachers so that they can develop and facilitate their own professional development through careful analysis of student learning will play a key role in sustaining a culture and system of professional growth. Creating communities of practice wherein teachers can observe, constructively critique practice, and reflect on student learning in authentic contexts will be helpful in achieving these goals.

While this paper examines the initial process of understanding how to support teachers in mathematics and in effectively integrating technology, broader perspectives from across content areas and leadership positions should be considered in order to better understand the larger landscape of support needed. It is recommended that future research consider these aspects as well as examining the challenges and supports provided to help other newly established schools in other geographical locations so that a more precise global picture can be developed.

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## CLASS CLIMATE FROM THE PERSPECTIVES OF STUDENTS WITH MIGRATION BACKGROUND AND SPECIAL EDUCATIONAL NEEDS

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### Abstract

One of the hidden mechanisms that make cognitive education work is the perceived class climate by students. There is some evidence that students with special characteristics have problems to participate satisfactorily in school lessons and at school (e.g. Chang, 2004).

Apparently especially students with migration background and special educational needs belong to this group (Van de Vijver, Helms-Lorenz, & Feltzer, 1999; Huber & Wilbert, 2012; Bakker & Bosman, 2003).

For this reason this cross-section study examines the class climate from the perspectives of students with migration background and special educational needs and controls.

**Objectives:** Does migration background or special educational needs lead to a more negative perception of class climate?

**Methods:** For this, 700 girls and boys from grades 4 to 8 in Germany were surveyed by a standardized questionnaire (Eder, 2000).

**Results:** Multivariate Analyses show diverse results. The perception of class climate differs between students with and without migration background and special educational needs depending on school grades and gender. Even more differentiation can be found on class climate subscales like teacher behavior and peers relationships.

**Conclusions:** Implications for the school based support of students perceiving a bad class climate are discussed – especially considering climate factors as important for successful teaching in inclusive school settings.

**Keywords:** *Class climate, migration background, special educational needs, inclusion.*

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## TRANSFORMING DISTANCE EDUCATION COGNITIVE DISTRIBUTION - CO-TEACHING AND CO-EVALUATION

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### Abstract

One problem with distance education systems is that are usually based on individual work, leaving the student isolated. This can be transformed into appropriate educational designs that take advantage of *distributed cognition* strategies and the advantages offered by online virtual classrooms, by creating a *Virtual Learning Environment (VLE)*. *Distributed cognition* assumes that intelligence, as knowledge and memory are distributed, they are part of the socio-cultural environments that surround the student. Our approach is to take advantage of distributed cognition through peer-based teaching (peers teaching), collaborative peer-to-peer work teams, but also using co-evaluation (peer assessment) where one team evaluates another. Teamwork and co-evaluation favor social interaction and the argumentation that promotes *epistemic activity* expressed in critical, creative and purposeful reflection in students.

In this study, a correlation analysis was carried out with 61 university students, who were studying psychology in distance education at the National Autonomous University of Mexico. The 61 students worked in three groups in virtual classrooms using a *Learning Management System (Moodle 3.1)*. The groups were divided into teams consisting of 3 to 4 students. Each team developed a collaborative essay, students wrote their ideas and proposals in discussion *FORUMS* and wrote their essay on a *WIKI* platform. The evaluation was based on rubrics by teams, with veiled identity, to avoid possible complicities or rivalries. Students co-evaluated the collaboration, epistemic activity and participation. We found statistically significant correlations between collaboration and epistemic activity, collaboration and participation, epistemic activity and participation ( $r = 0.845$   $p < 0.01$  \*\*,  $r = 0.861$   $p < 0.01$  \*\*,  $r = 0.848$   $p < 0.01$  \*\* respectively), which indicates that there is congruence and that collaborative work was positive.

**Keywords:** *Distance education, collaborative work, peers teaching, peer assessment, epistemic activity.*

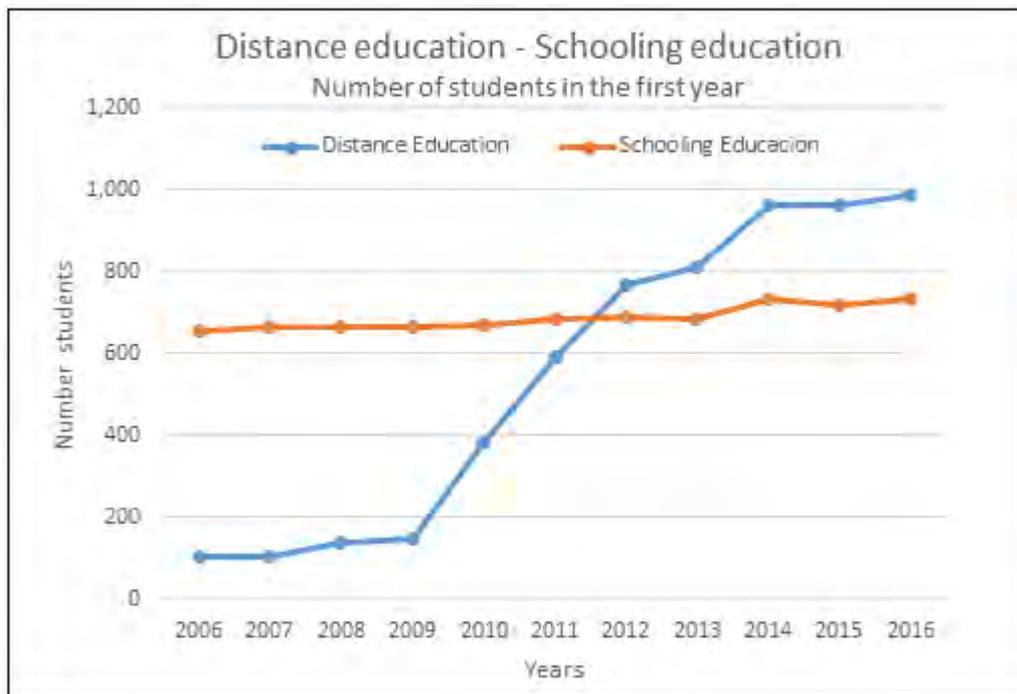
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### 1. Theoretical framework

Providing higher education is a big problem in the world, because it is very expensive. It is necessary to have a good teacher's well-formed, with knowledge discipline domain and pedagogical skills, with capacity to research and innovate, committed and motivated to fulfill the institutional aims. But the problem is not only teachers, there are other costs such as infrastructure, it is very expensive both buildings and equipment. But there are also the operating costs generated by the maintenance. These problems make it difficult for Governments to have an offer enough to satisfy the demand, creating a deficit that becomes cumulative, which is particularly critical in developing countries.

This problem can be faced with the new digital technologies, that open new possibilities to meet the demand for higher education, offering alternative path to the education system. Therefore, there is a great interest to develop research that translates into technologies that allow the development of open education systems, both online and distance education. We observe that *distance education* is now growing rapidly, while schooling education (presence/face-to-face) is growing very little, as can be seen in *figure 1*, the case of psychology degree at the *National Autonomous University of Mexico - Iztacala campus*, where there are already more students in the system of distance education.

Figure 1. Distance education - Schooling education.



In our research project we aim to address the problem of that *distance education*, we do research on educational designs that can offer viable alternatives to the educational methods mediated by computer.

In *distance education* in Mexico, we observe that there are high dropout rates, around 23% higher than those observed in the schooling education system. When comparing by generational (cohorts) of the schooling system and the distance system, it is surprisingly observed that in schooling 86.6% of the students finish their studies, and in distance just 9.5% conclude.

According to our research, we consider that a great problem in distance education systems is that they are usually based on individual work, students work in a poorly communicated way, in an isolation that we consider to be one of the factors of incidence in the high dropout that is observed in this educational modality. Besides feeling of abandonment, teachers are slow to respond because they are overworked, since personalized online attention is very time demanding for teachers. Due to the student's lack of interaction and lack of interaction with teachers, his sense of institutional identity is weak, there is little self-regulation, and high dropout rates are observed. This is why we are developing a research program that allows, based on the empirical observation empirical field observation, to propose alternatives that allow the transformation of distance education.

Based on Vygotsky's theory of mediation, we think that technology is a mediation tool with the broad potential for transforming the psychological processes of learning. Distance education is mediated by digital platforms that operate online, which offer endless of possibilities for transforming the educational processes. One advantages offered are virtual classrooms through new Virtual Learning Environment (VLE) (Dillenbourg, et al. 2002), because they allow for new educational arrangements. There is also the MOOCs (Massive Open Online Course) that are offered online openly at international level (Perna, L. et al., 2014). Or collaborative work strategies and planning of self-regulation and co-regulation, which are resources that could to promote discursive interaction among students with diverse capacities. These advantages can without doubt transform the Online education in a very meaningful way.

Distance education can be transformed by collaboration (Dillenbourg, 2009), under appropriate educational designs that take advantage of strategies that provide the principles of distributed cognition. Distributed cognition assumes that intelligence, knowledge and memory are distributed, are part of the socio-cultural environments that surround the student and should be used. Cole and Engeström argue: "...it is necessary to transform the notion that conceives human cognition as a function that exists only within the person ... [because] cognition is distributed among people, knowledge is socially constructed through collaboration ... information is processed between people and the tools or artifacts provided by culture." (Cole & Engeström 1993: 46). Hence the promotion of *collaboration* in a co-teaching (Coll, et al. 2009) and co-evaluation process can deeply transform the distance education, forming

dynamics where each student learns from the others by the *zone of proximal development* (Vygotsky, 1980).

Our approach is to take advantage of *distributed cognition* through co-teaching (peer-based teaching), based on the formation of work teams that develop trials and are co evaluated (peer assessment), where one team evaluates to another.

Collaborative teamwork fosters social interaction, breaks down isolation, builds community with other students, favors co-regulation and self-regulation by establishing commitments to the group, online interaction creates group links, promotes a sense of institutional belonging, helps to create an identity. In addition to the benefits of social interaction, at the cognitive level, interaction with other students allows the development of the *epistemic activity* (Weinberger, et al. 2005), that involves the construction of knowledge, based on critical, creative and purposeful reflection, under a dynamic of argue and counter- argue based on evidence to build consensus (Toulmin, 2003). So that each student constructs and develops his or her own conceptual structures, as proposed by constructivism (Savery & Thomas, 1995). Under the principles of formative evaluation, it assumes that evaluation can be an extremely valuable resource for developing student training, by providing information (feedback) in a contingent and expeditious way, promoting reflection on the responses given throughout the progress and not at the end, as it is done in the summative evaluation (Bloom, Hastings & Madaus, 1971).

This research has explored the effects of co-evaluation, where students evaluate their classmates based on rubrics, requesting that they not only make a judgement of the quality of the work of their peers, but support it with arguments, giving opportunity to the student to know these arguments and to be able to counter-argument if they disagree, which, as already indicated, promotes students' *epistemic activity*.

In co-evaluation, students need to judge, value. In order to do this, they need to use their own knowledge and reflections, they promote feedback by peers (Gielen and De Wever, 2012), to incite *epistemic activity* allowing to construct new meanings by proposing critical and purposeful reflection based on evidence-based argumentation (Zenios, 2011).

## 2. Objective

The purpose of this study is to improve distance education systems through educational design, taking advantage of digital media and distributed cognition that can be given in collaborative work.

The research questions that support the working hypotheses are:

If *collaboration* is promoted by the development of a team essay, then will be a greater *contribution*?

If the *participation* is promoted in the elaboration of the essay there is greater *epistemic activity*?

## 3. Design

The students' work was developed online from a platform that allowed the design and regulation of student interactions, conceived as a mediation process that regulates the behavior of participants supported in a virtual classroom through a *Learning Management System (Moodle 3.1)*.

The process begins with a video-recording of introduction to the course, which welcomes students, explains the dynamics of the course and highlights the relevance of collaborative work.

Throughout the course the students have to develop *conceptual maps (Cmap tool 5.02 -IHMC)* for each thematic unit of the revised curricular contents.

The groups are divided and integrated into work teams to promote collaboration in the elaboration of an essay focusing on one of the revised curricular themes. The *conceptual maps* previously elaborated, constitute a resource for the development of the essay. The essays are made in the virtual classroom using FORUM discussion and is written on a WIKI platform that allows editing and review of the editing history by each of the team members.

In order to regulate the collaboration process, protocols (collaboration scripts) were used, consisting of a series of indications about the activities required to be performed by the students, which are given by the phases that integrate and comprise the process of elaboration of the essay in equipment by the team.

The students co-evaluate the quality of the essay and the collaboration process, based on rubrics that define the criteria to be evaluated and the scale for assessing the rating level of performance: low, medium low, medium high, high. It is important to note that the identity of the students is veiled, so that it is anonymous, to avoid possible complicities or rivalries.

To evaluate the collaboration among students, based Coll et al. (2009), a questionnaire was developed on the concepts of "*distributed teaching*", using three dimensions: *collaboration, participation*

and *epistemic activity*. *Collaboration* was evaluated with 4 items: 1.- Proposed agreement to establish tasks and commitments in the group. 2.- Met their commitments assumed in time. 3.- Evaluated if the actions of the companions stuck to the agreements. 4.- Was respectful and friendly with teammates. *Participation* was assessment by 3 items: 1.- Made pertinent proposals to elaborate the work. 2.- Made pertinent proposals based on the work done by the partners. 3.- Evaluated the work made by colleagues proposing improvement adjustments. And *Epistemic activity* was measured with 5 items: 1.- Presented original ideas. 2.- Supported his ideas with documented sources. 3.- Participated in arguing or counter-arguing the approaches exposed. 4.- Took into account the contributions of others in their approaches so that integrated. 5.- Synthesized or summarized the contributions made in the collaborative essay.

#### 4. Subjects

Sixty-one first-entry students enrolled in the *Open University and Distance Education System (Sistema de Universidad Abierta y Educación a Distancia - SUAyED)*, from the *National Autonomous University of Mexico*, enrolled in psychology in *FES Iztacala campus*. The three school groups were composed of 27, 15 and 19 students respectively.

#### 5. Results

From the obtained scores a summation was made for each dimension, a correlation analysis was performed between the dimensions of the instrument of co-evaluation, obtaining the following results. *Collaboration* correlated with the *epistemic activity* ( $r = 0.845^{**} = p < 0.01$ ). It is observed that the process of *collaboration* is closely related to the *epistemic activity*, thus responding to the hypothesis of work in which it is assumed that if collaboration is promoted there is greater epistemic activity, that is, the *cognition distributed* within the group is strengthened.

The *collaboration* process also correlated with the *participation* ( $r = 0.861^{**} = p < 0.01$ ). in the elaboration of the essay. It is appreciated that social interaction was also strengthened among students. Another observed correlation occurred between the *epistemic activity* and the *participation* in the elaboration of the essay ( $r = 0.848^{**} = p < 0.01$ ). That indicates and reaffirm that the social interaction in the elaboration of the *collaborative* essay favors the *epistemic activity*. It indicates to us that the *distributed cognition* is a useful paradigm that allows to enrich the educational designs.

#### 6. Discussion

We believe that the co-evaluation process should be enriched from other components such as the student's self-assessment, the meta-evaluation (how student considers will be evaluated by his peers). The validity of the co-evaluation can also be enriched by data analytic, using the indicators generated by the records of the online activity, for example, if a student co-evaluates a colleague by pointing out that he has low performance, online activity registers of WIKI or FORUMS is possible to know who had less or more activity.

Another point of consideration would be to create indicators that allow to evaluate if the permanence and the exit are favored by the work in collaboration. As we worked with first semester groups this is not easy to evaluate.

#### 7. Conclusion

It is observed that the process of *collaboration*, according to the indicators obtained promotes the *epistemic activity* of students, which is very relevant. It is noteworthy that the indicators observed by the correlations that are obtained between the process of *collaboration* with the *epistemic activity* and the *contribution* in the elaboration of the essay, confirm that there are close relations, there is consistency, this coherence can be taken as an indicator of the validity in the evaluation of the *collaboration* process and indicate that there are elements to indicate that *distributed cognition* is a good theoretical paradigm to make educational designs.

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## **DEVELOPING AND ASSESSING THE GENERIC PROBLEM-SOLVING SKILLS OF UNDERGRADUATE STUDENTS**

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### **Abstract**

Generic problem-solving skills (PSS) of university graduates are becoming an increasingly more desirable outcome because modern workplaces no longer rely solely on knowledge of existing routines, but require adaptability and competent problem solving; therefore, the ability to problem solve is a highly valued competency expected of university graduates, independent of their area of study. PSS training is hindered by a shortage of available tools for monitoring student progress and by lack of defined instructional strategies for development of these skills. Our research is aimed at addressing both of these issues. We have developed an evaluation tool, which we applied to study the dynamics of undergraduate student PSS. We tested first- and upper-year students from 26 different courses (2,229 enrolled students). Overall improvement of PSS was detected for the first-year students over their first term of study, with two different groups of students showing a statistically significant increase in test scores. Even though no significant overall PSS improvement was detected in upper-year students, there was a strong trend towards significantly improved generic PSS in upper-year students compared to the first year students. These observations were confirmed in a follow-up study conducted the subsequent academic year involving an independent group of 1,073 participating students, as well as through a longitudinal study aimed at re-testing first-year students after they had completed two years of undergraduate studies at our university. Our data indicate that most of the standard lecture approaches do not develop undergraduate student PSS. However, we have previously demonstrated that introducing tutor-less problem-based learning (PBL) in a large third-year science class leads to statistically significant improvement in PSS of students taking this course. Our current data also indicate that team projects involving ill-structured problems could be one of the successful strategies for developing the generic PSS of undergraduate students. We conclude that universities and individual instructors must take active steps in order to advance the generic PSS of students taking their classes. Improvement in this critical skill set represents a highly desirable outcome of university education. In addition to discussing our research data, this presentation will outline the PBL technique used in large classes of 20 to 100 students and will describe the PSS evaluation tool used, which is available to all interested instructors.

**Keywords:** *Assessment, higher education, problem-based learning, problem-solving skills, undergraduate students.*

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### **1. Introduction**

University students as well as their prospective employers value problem solving as one of the most desirable learning outcomes (Adams, 2014; OECD, 2014). Problem-solving skills (PSS) can be discipline-specific and generic. Thus far, research on PSS has mainly focused on discipline-specific skills, for example, of mathematics (Adeyemo, 2010), physics (Latterell, 2003), and accounting students (Jones and Davidson, 2007). However, generic (also known as domain general) PSS are being increasingly recognized as critical for the career success of students regardless of their field of study (Greiff et al., 2013). There are no widely accepted and proven techniques for the development of student PSS. It has been suggested that discipline-specific problems could be used to advance the generic PSS, but such skill sets may not readily transfer to other disciplines (Adeyemo, 2010; Tricot and Sweller, 2014). Our study investigates changes in the ability of students to solve generic problems before and after they have taken regular university classes or have participated in the process of problem-based learning (PBL). Cooper et al. (2008) have suggested that working in small groups on ill-structured problems could lead to improved PSS.

The lack of freely available PSS tests that could be used to monitor the advancement of this skill set presents an additional significant challenge. Some of the existing measurement tools, such as American College Testing, do not focus on the problem-solving ability of students in addition to being costly. The Programme for International Student Assessment (PISA), which is operated by the Organization for Economic Co-operation and Development (OECD), started measuring generic PSS in 2012 and is developing a tool for assessing these skills in adults (OECD, 2012). In our previous study, we introduced two generic PSS tests of similar difficulty level by adopting questions from the PISA generic problem-solving item bank. We used them in a crossover fashion to compare the change in PSS of students taking mainly lecture-based courses with that of students taking a PBL-based course. We found that the latter group of students demonstrated statistically significant improvement in their PSS, which was different from students exposed to mainly lecture-based instruction (Klegeris et al., 2013).

Subsequently, we applied the same tool to a large group of 2,229 students taking one of 26 different courses from a diverse range of disciplines. The goals of this study were to 1) identify the instructional strategies that enhance the generic PSS of students over one term of studies, and 2) to assess the overall dynamics of PSS of students from our university by comparing the test results obtained by students from the first and upper years (Klegeris et al., 2017). We found statistically significant overall improvement of PSS for the first-year students over their first term of study. In addition, students from two different first-year classes showed statistically significant increase in the PSS test scores. No significant overall PSS improvement was detected in upper-year students compared to the first-year students, even though their scores were higher with a strong trend towards significance (Klegeris et al., 2017). Since this study was conducted over one academic term, the comparison between the first- and upper-year students involved two different groups of students, and therefore was not accurate due to possible intrinsic differences in the problem-solving abilities of these different student populations. Our current study was designed to confirm these initial observations on an independent group of students and to perform a longitudinal study, where students who wrote the PSS test during their first year of study were re-tested two years later by using the same tests.

## 2. Methods

### 2.1. Participants

The study was made possible by the voluntary participation of the students taking courses at the University of British Columbia (UBC) Okanagan Campus in Kelowna, BC, Canada. This study was approved by the UBC Human Research Ethics Board and students who signed an appropriate consent form were enrolled in this study. For the first part of the study conducted over a single academic term, 1,073 students taking one of 17 different first- or upper-year courses participated in this study by writing one or both problem-solving tests. The longitudinal data were collected by testing students from one of nine different third-year courses; 150 students who had taken the test two years earlier signed the consent form and wrote one or both problem-solving tests.

### 2.2. Problem-solving tests

Questions from the PISA PSS test tool (OECD, 2004) were adopted as described in our previous publications (Klegeris et al., 2013, 2017). Two tests (Tests 1 and 2) of similar difficulty level were used. The PISA questions assess the generic problem-solving abilities of students; therefore, they are not discipline specific and can be answered by all students regardless of the courses they take. An example of a problem-solving question used is presented in Table 1. The purpose of designing two different PSS tests of similar difficulty level was to enable measurement of the dynamics of the problem-solving skills of students over the course of a single term. At the beginning of the term (September), the two tests were administered to students in a random manner. At the end of the term (November) the tests were administered again, making sure that individual students did not write the same test twice. Therefore, all students wrote two comparable in difficulty tests at two different time points during the term. Students were given 15 minutes to complete the test. All tests were marked in a blinded manner by, first, coding all the answers and removing the student names and completion dates. Subsequently, the tests were shuffled into a single pile, which was given to blinded markers. One of the tests was assessed to be of a slightly higher difficulty level than the other, therefore a linear equating method was applied as described in our previous publication to transform the scores from one of the tests (Klegeris et al., 2017).

## 3. Results

Figure 1A shows PSS test scores (means  $\pm$  standard error of the mean) obtained from the first- and upper-year students at the beginning of the fall term (September) and at the end of the same

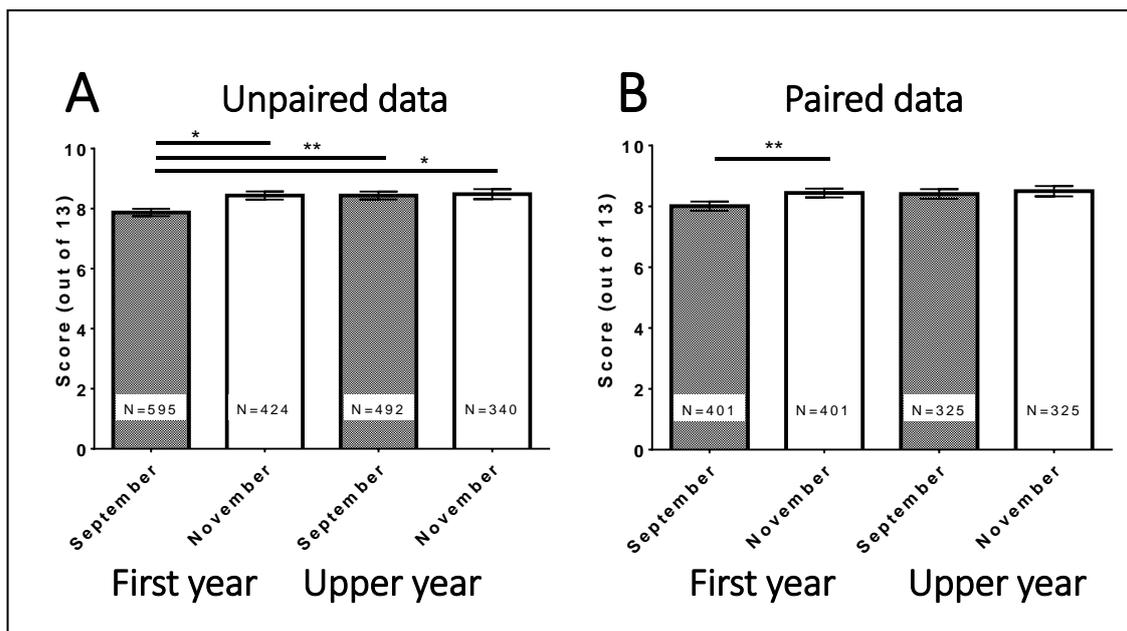
term (November). Figure 1A shows data from all students writing one or both tests. The maximum score for both tests was 13 points. Analysis of variance (ANOVA) followed by the Tukey's post-hoc test for multiple comparisons showed that the test scores of first-year students at the beginning of the term were significantly lower compared to their test scores at the end of the term, as well as from the test scores of the upper-year students at the beginning and at the end of the same term. The comparison between the data obtained from the first- and upper-year students should be viewed as preliminary data since the tests were written by two different groups of students. Similar to our previous study (Klegeris et al., 2017), we found that more students wrote the test at the start of the term compared to the end of the term (595 compared with 424 for the first-year courses, and 492 compared with 340 for the upper-year courses). These two partially overlapping groups of students may be intrinsically different in their problem-solving abilities. Therefore, we re-calculated all problem-solving test scores for the first- and upper-year students by using data collected from only those students who wrote both tests (401 first-year students and 325 upper-year students). Figure 1B illustrates that removing data from students who wrote just one test led to decrease in the absolute values of improvements in PSS test scores. According to the paired Student's t test applied in this case, the only statistically significant difference was between the test scores of the first-year students obtained at the beginning and the end of the term. No statistically significant differences between the test scores of the first- and upper-year students were observed when data obtained from students writing both tests were used.

Table 1. An example of a question used in the problem-solving test.

|   |                       |                            |                             |
|---|-----------------------|----------------------------|-----------------------------|
| The Zedish Community Service is organising a five-day Children's Camp. 46 children (26 girls and 20 boys) have signed up for the camp, and 8 adults (4 men and 4 women) have volunteered to attend and organise the camp. |                       |                            |                             |
| <b>List of Adults</b>   |                       | <b>List of Dormitories</b> |                             |
| Mrs. Madison  |                       | <b>Name</b>                | <b>Number of beds</b>       |
| Mrs. Carroll  |                       | Red                        | 12                          |
| Ms. Grace   |                       | Blue                       | 8                           |
| Ms. Kelly   |                       | Green                      | 8                           |
| Mr. Stevens   |                       | Purple                     | 8                           |
| Mr. Neill   |                       | Orange                     | 8                           |
| Mr. Williams  |                       | Yellow                     | 6                           |
| Mr. Peters  |                       | White                      | 6                           |
| <b>Dormitory rules:</b>   |                       |                            |                             |
| 1. Boys and girls must sleep in separate dormitories.   |                       |                            |                             |
| 2. At least one adult must sleep in each dormitory.   |                       |                            |                             |
| 3. The adult(s) in a dormitory must be of the same gender as the children.  |                       |                            |                             |
| <b>Question 1:</b> Dormitory allocation   |                       |                            |                             |
| Fill the table to allocate the 46 children and 8 adults to dormitories, keeping to all the rules.   |                       |                            |                             |
| <b>Name</b>   | <b>Number of boys</b> | <b>Number of girls</b>     | <b>Name(s) of adults(s)</b> |
| Red   |                       |                            |                             |
| Blue  |                       |                            |                             |
| Green   |                       |                            |                             |
| Purple  |                       |                            |                             |
| Orange  |                       |                            |                             |
| Yellow  |                       |                            |                             |
| White   |                       |                            |                             |

Interestingly, longitudinal data analysis showed a statistically significant improvement of student PSS test scores after two years of study. After testing 642 upper-year students enrolled in one of nine different classes, we were able to collect longitudinal data from 150 students. Their average score from the tests they wrote during the first term of their first year of study was  $7.9 \pm 0.2$  (out of 13) and from the test taken during the first term of their third year of study was  $9.4 \pm 0.2$  (out of 13). Paired Student's t test indicated a statistically significant 1.5 point difference ( $P < 0.01$ ), which is equivalent to an 18% overall improvement.

Figure 1. Comparison of test scores obtained from first- and upper-year students at the beginning and end of the semester.



\*  $P < 0.05$ ; \*\*  $P < 0.01$  ANOVA, followed by the Tukey's post-hoc test (A).

\*\*  $P < 0.01$  Student's t test for paired observations (B).

Data are presented as means  $\pm$  standard error of the mean.

#### 4. Discussion

The data presented confirm and extend our previous observations (Klegeris et al., 2017) that the generic problem-solving skills of undergraduate students improve significantly during the first term of their university studies. Statistically significant improvement was observed by analyzing data obtained from 401 first-year students, which was a group different from the 305 students completing both PSS tests one year earlier (see Klegeris et al., 2017). Unlike our previous study, no trends or significant differences between the scores of first- and upper-year students were identified, but as noted above, these comparisons involved two distinct populations of students, which may have different intrinsic problem-solving abilities; therefore, these data should be viewed with caution. To overcome this shortfall, longitudinal data were collected by testing a group of students repeatedly at the beginning of their university studies and after they completed two years of course work. We were able to collect longitudinal data from 150 students, which showed a statistically significant 18% improvement in the PSS test scores. Such a significant improvement in test scores collected through the longitudinal study contrasts the lack of significant effects observed during this and our previous study by comparing results from two different cohorts of students. These previous non-significant observations might have been caused by the fact that the first-year students participating in the study were better problem solvers than the group of students taking upper-year courses during the term when the study was conducted; therefore, the PSS test scores for these students were at par with the scores of upper-year students even before they started university studies. It can also be argued that the improvement observed during the longitudinal study was caused by the fact that students wrote the same tests twice; however, this seems to be the less likely possibility since most students had forgotten these PSS tests during the two years during which they had to take a multitude of other examinations and quizzes. Even though these observations need to be confirmed in a larger population of students from different universities, our data indicate that attending university could have a positive effect on the generic PSS of students.

Our current study also demonstrates that the PSS tests used could be a useful tool for monitoring the dynamics of PSS of students. The overall study design as well as the tests used could be adopted by professors and instructors who are interested in the development of generic PSS of students. We are currently not able to pinpoint exactly which types of learning activities facilitate the development of generic PSS of students. Interviews with instructors indicate that small group work and PBL activities could be effective. This conclusion is supported by Cooper et al. (2008) who found that PSS was improved by students working in small collaborative groups. Gayon (2007) and Anderson et al. (2008) concluded that using PBL cases increases student scores on assessments of PSS, which is similar to our previous observations (Klegeris and Hurren, 2011; Klegeris et al., 2013).

Our data demonstrate, for the first time, improvement of generic PSS of undergraduate students over two years of study. We also concur with previous studies showing that active, student-centered instructional strategies, such as PBL, provide beneficial student experiences that translate into professional growth of students, in addition to mastery of course content. We agree with Adams (2014) who states that problem solving is a critical skill for 21st century learners. The future goal of our research is to identify methodologies that could be implemented in university classes to help students develop this important and valued skill set.

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# IDENTIFYING STUDENTS-AT-RISK IN SCHOOLS AND WHAT NEXT? PROMOTING REMEDIATION IN THE SCHOOL LEADERSHIP PROGRAMME

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## Abstract

This article reports on the findings of the study in which the researchers sought to understand the significant of remedial action after diagnosis and categorisation of students-at-risk, as part of lessons learnt in the implementation of Advanced Certificate in Education-School Leadership and Management programmes rolled out by universities in Limpopo Province, South Africa. A qualitative case study research design was adopted wherein thirty purposively selected student principals participated in the unstructured interviews and the document study. The findings revealed that teachers' duty to engage in remediation was not implemented and that school leaders do not properly monitor the process. This study concludes that educationally challenged students require school intervention before referrals are made. However this area was neglected by educational professionals who are well-grounded in teaching, learning and assessment and resultant is educational exclusion that leads to social and economic exclusion at later years. This study recommends that student at risk and remedial policies and plans should form part of school leadership programmes. Furthermore, Department of Education should roll-out an in-service training on screening and identification of students at risk; and remediation to support schools in addressing educationally challenged students.

*Keywords: School leadership programme, student at risk, remediation, educational professionals, educational exclusion, social and economic exclusion.*

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## 1. Introduction

A need to improve school leadership has led South African Education Ministry to roll-out Advanced Certificate in Education-School Leadership and Management development programmes. A need arose as a result of ineffective school leadership (Bush, Joubert, Kiggundu & Van Rooyen, 2010) and the recognition of school leadership training programmes (Naicker & Mestry, 2015). This evaluation of ACE-SLM programme was guided by Patton (2002) who emphasized the significance of monitoring the achievements of the programme outcomes and describing the nature of implementation that impacted on good classroom and school leadership practices. Identification and categorisation of student at risk and remediation are school activities which should be seen executed to help student with diverse needs, ranging from educational needs to psychological needs. Research reveals that behaviors such as disobedience, inappropriate language, disrespect, defiance, disruption and excessive noise are the most frequent reasons for office referrals (Tom and Stuart 2014: 6), in the United States. South Africa is not exceptional.

### 1.1. Problem statement

A problem for this study is failure to identify student at risk and provide adequate remediation. School leaders neglect their duty of providing plans and policies on student at risk. Failure to identify and categorize student-at-risk, leads to failure in providing adequate remedial action. School leaders were found to lack internal control systems to implement, and monitoring student-at-risk and remediation. In cases where students/learners who are educationally and behaviourally challenged are not identified and assisted through remediation, they drop-out of school. The Ministerial Committee report on Learner retention in the South African Schooling system (2008 xi) reveals that 'there is a problem of learner retention, which is more pronounced after Grade 9. Student at risk are vulnerable students and need to be identified and assisted. Sign (2015: v) recommends that different student support structures, strategies and policies should be made available to accommodate diverse learners and their challenges.

## 1.2. Purpose and research questions

The study aimed at investigating the experiences and reflections of school leaders on student at risk and remediation in the School Leadership programme. In an attempt to attain the stated purpose, the following research questions were identified:

- What is your experience on identification and categorization of student at risk as component of school leadership curriculum?
- What is your experience on monitoring remediation action?

## 2. Theoretical Framework

The conceptualisation of ACE-SLM programme was premised upon organisational development theory, which guided the Department of Basic Education in the identification of curriculum that aimed at achieving ACE-SML programmes' outcomes as a way to address challenges identified by Task Team on Educational Management and Administration in South Africa (DBE, 2008). The evaluation study used organisation development theory (ODT) to understand the significant of remedial action after diagnosis and categorisation of students-at-risk. Organizational development theory provides guidelines on how schools as organizations need to be developed and improved (Thaba-Nkadimene 2017). Within this frame student at risk was understood as referring to vulnerable students (Sign 2015:v), whereas, remediation was understood as improving classroom and school leadership practices through provision of extra classes for educationally challenged learners. After identification, referrals are made for behaviourally challenged learners.

## 3. Research Methodology

### 3.1. Research design

The study adopted qualitative case study research design because it provides tools for researchers to study complex phenomena within their contexts (Baxter and Jack 2009: 544).

### 3.2. Research methods

The unstructured interviews and document study were used as data collection methods. Thirty student principals were purposively selected to participate in the interviews, and their schools participated in the document study. Gathered data were presented and discussed using content analysis and narratives.

### 3.3. Quality issues

In this study triangulation was achieved on the basis of methods and respondents that improve the trustworthiness of the research. According to Yeasmin and Rahman (2012: 154) 'triangulation' is a strategy that increases the validity of evaluation and research findings.

## 4. Findings

### 4.1. Key findings from interviews

The student principals reveal that curriculum was not clear on student at risk; however it was embedded within curriculum leadership and management module. Participant 16 highlights that *'i did not realise the significant of Student at risk, until one of the facilitator visited my school on monitoring and evaluation. I was asked if I was school policy on student at risk and plans. By then I had nothing, and I enquire what was expected. From that point I realised how important is this activity, and I made sure policies and plans are in place'*.

Similarly, remediation was found not be covered within school leadership curriculum; however it was included in curriculum leadership and management module because of its significance in improving classroom practice. Participant 23 highlights that *'I used to engage in remedial work in my school, but after School Leadership programme, I was able to develop policies and plans for proper implementation of remediation in my school'*.

Monitoring tool used by mentors and lectures captured exactly what was expected of student at risk and remediation and helped mentors, monitors and student principals were able to understand competencies required on these aspects. The ACE-SML schools realised the significant of formulating student at risk and remedial policies and plans as means to improve best classroom and school leadership practices. Student principal 11 highlights that *'I was able to help my school develop many school policies including student at risk and remediation policies and plans. We were then able to identify student at risk, and most importantly, we were able to categorize student at risk for different remedial actions. This*

*helped my school attain 86% matric pass rate from 62%. I know the importance of identification and categorization of student at risk and remediation, because it worked for my school'.*

The student principals had different experiences on control and monitoring plans for remedial action. Others use policies and plans as control measures whereas others did develop stand-alone control and monitoring plans for remedial actions. Student principal 12 highlights that *'As a staff, we agreed on the formulating of control and monitoring plans and tools for remedial action. The tools are monitored by remediation committee and school management teams'.*

However, the processes were not just smooth, since it involved many stakeholders. It was revealed that the staff members and parents and other family members were mostly involved in the processes. Student principal 5 highlights that *'at first, it was hard to get teachers' cooperation when they have to render afternoon classes and work extra time. After a while, everybody was used to it and it became interesting job to help those in need'.*

#### **4.2. Key findings from document study**

The four item template was used to gather data for document study. It covered student at risk, remediation, control and monitoring and remedial committee. Eighteen schools were found to have student at risk and remedial policies and plans, whereas in the twelve schools, there was nothing. Control and monitoring of remedial actions was found available in thirteen schools, whereas in the other five school they claim to use policies and plans as control measures. Remedial committee was found to be in existence and functional in fourteen schools. Other schools claim to use SMTs for purposes of identification and categorisation of student at risk and control and monitoring remediation processes.

#### **5. Conclusion and recommendations**

This study concludes that educationally and behaviourally challenged students require school intervention before referrals are made. However this area was found to be neglected by educational professionals who are well-grounded in teaching, learning and assessment and resultant is educational exclusion that leads to social and economic exclusion at later years.

The study recommends that student at risk and remediation as well as their policies and plans formulation needs to be included in the curriculum of School Leadership programme. Furthermore, Department of Education should roll-out an in-service training on screening and identification of students at risk; and remediation to support schools in addressing educationally and behaviourally challenged students.

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**Appendix A**

1. Did School Leadership programme' curriculum provides for student at risk?
2. Was remediation a component of School Leadership curriculum?
3. Did you help in developing student at risk and remedial policies and plans in your school?
4. Do your school have control and monitoring plans for remedial action?
5. What were challenges encountered in implementing student at risk and remediation policies in your school?

**Appendix B**

| Item                   | Policy | Plan | Comment |
|------------------------|--------|------|---------|
| Student at risk        |        |      |         |
| Remediation            |        |      |         |
| Control and monitoring |        |      |         |
| Remedial committee     |        |      |         |

## DEFINING THE PRE-VOCATIONAL CURRICULUM: A CASE STUDY IN THE DESIGN OF THE BTEC LEVEL 1 INTRODUCTORY QUALIFICATION

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### Abstract

Recent policy reforms on technical education in England call for ‘up to a year of tailored and flexible support’ for those learners who are not ready to access a technical or academic route aged 16. A number of drivers may determine what is included in this transition year, with all indications being that the needs of employers will be paramount in defining this curriculum.

Other than references to the transition year, the new policy seems to have overlooked the group of young people, who having had a negative school experience, may lack the basic educational means to progress further without significant intervention. With the limited progression opportunities available to these learners, there is a very real risk that getting the ‘transition’ wrong for those who have few (or no) qualifications post-16 could result in a very high number of young people with no realistic options for progression.

This study considers the purpose(s) of this transition year or ‘pre-vocational phase’ for learners whose primary aim is to progress to further study, rather than develop technical skills in anticipation of imminent entry to the labour market. In doing this, the paper draws on previous work looking at the role of post-16 vocational provision for low attaining pupils and its fitness for purpose in shaping a future workforce as well as addressing issues of social inclusion and widening participation in education.

In developing a new suite of BTEC qualifications, considerable work was undertaken at Pearson to identify the purposes of post-16 Level 1 provision and how it could have the best possible impact on the learners. The reaction from colleges to the proposed qualifications prior to first teaching has been positive but a more detailed analysis on the impact of the qualifications and specifically how they support learner progression needs to be undertaken now.

In this study, consideration is made of what a ‘transition year’ should look like both from the most recent policy perspective and in response to challenges faced by the diverse groups making up this cohort of learners. Drawing on recent academic responses to post-16 policy and provision and early responses to the new BTEC Level 1 provision available from September 2016. The paper will argue that at level 1, the focus should be on the needs of the individual learner and not the employer.

**Keywords:** *Pre-vocational, low attainment, BTEC, transition, policy.*

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### 1. Introduction and Context

This paper draws on the research and development process used to create the *BTEC Level 1 Introductory* qualifications available for first teaching in England from September 2016; early findings from the evaluation of the first year of delivery of this qualification will be presented in June 2017.

These qualifications have been designed to support the progression of low attaining learners into upper secondary, accessing a technical education route, leading to further qualifications, training or employment at age 16 and beyond.

Recent policy on vocational education in England sets out a plan for the development of technical and applied qualifications in 15 employment sectors at level 2 (EQF Level 3). These newly defined routes will be accessed by all 16 year olds, and are designed to provide clear pathways for young people to navigate to Higher Education (HE) or employment with the stated intention of meeting skills shortages. The technical routes encompass apprenticeships as well as classroom-based qualifications and are scheduled to be fully implemented by 2020 (BIS and DfE, 2016). For those learners who are not yet ready to access a technical or academic route at age 16, the policy calls for ‘up to a year of tailored and flexible support’ (p.28) in a transition year, but unlike the technical routes, scant details on the content of the learning programmes themselves. Repeating elements of English and maths that were not achieved at school is a given, but there are a number of competing drivers which may determine what else is included

in this transition year with all indications being that the needs of employers will remain paramount in defining this curriculum.

Partly in response to this policy and partly in response to feedback from teachers, Pearson embarked on a significant redevelopment of their level 1 qualification suite in 2015. This paper summarises the literature underpinning this research and development process and discusses early findings from the evaluation of the implementation of the new qualifications.

### 1.1. The BTEC Level 1 Introductory Qualifications

These technical qualifications (Pearson, 2016) were devised throughout 2015 to be delivered in Further Education (FE) colleges in England to predominantly 16-19 year olds with an attainment record from key stage 4 (lower secondary) which is too low to progress on to a Level 2 technical or general qualification.

Typically, previous equivalent versions of these level 1 qualifications have focussed on an isolated or simplified set of skills and knowledge within an employment sector, taken from higher level qualifications which are used to gain access to jobs. This has effectively created a suite of *foundation* qualifications which serve as an introduction to the sector but not necessarily entry to the labour market. Research carried out by Pearson in 2015 (Pearson, 2015) with teachers and college managers, suggested two main problems with this approach. Learners with low levels of school attainment may not always be in a position to make good choices about a chosen career in the weeks and months following the receipt of disappointing exam results and therefore needed a chance to change pathway at a later stage. Secondly, and more significantly, many teachers reported that creating foundation versions of sectoral qualifications was demotivating for learners as the qualifications themselves didn't actually qualify young people for anything in particular, and learners would have to repeat much of the same content again the following year when they took the higher level technical qualification.

In response to this, Pearson changed the approach to the development of content for the new qualifications to focus on the acquisition of the generic and learning skills that would be needed to progress to Level 2. These skills would then be studied within a 'vocational context' to give learners a flavour of the occupation, rather than learn specialist technical skills or knowledge. For instance, for a new *Introductory Diploma*, all learners, regardless of their chosen sector are required to study the following modules:

- Being Organised
- Developing a Personal Progression Plan
- Working with Others
- Researching a Topic

Learners then take a number of specialist units from one or more chosen sectors such as Business, Art and Design, Caring for Children or Engineering, to compliment these units, all of which have been mapped to show where these skills can be demonstrated in a work-related context.

The idea of this being that the four main modules listed encompass the skills and understanding a learner should master before they progress to level 2 programmes; the optional units are merely a vehicle for applying those skills and they should not repeat any of the technical skills and knowledge they will come across at level 2.

As part of a long term programme to measure the impact and efficacy of qualifications, Pearson Education in the UK have designed a two-year research study to assess to what extent these qualifications improve progression opportunities for learners.

## 2. Research Questions

The following research questions are addressed in the two-year study, with early findings on the first three questions available in summer 2017:

1. How are current educational policies affecting Level 1 Learners?
2. How are teachers and learners engaging with the new 'pre-vocational' approach of the qualifications?
3. What approaches are being used for delivery and continuing professional development (CPD) for staff?
4. Which learner characteristics are the qualifications particularly suited or unsuited?
5. Is the qualification suitable to enable a satisfactory transition to Level 2 on completion?

## 3. Methodology

A case-study approach is used to explore teacher and learner perceptions and experience in three different FE colleges, all based in, or close to, London, England. As the qualifications were delivered for

the first time in the year 2016/17, and to relatively small numbers, the first year of this study denotes an exploratory phase, where the main research questions will be refined. In year 2 a deeper dive into one college will enable a more comprehensive picture of learners' progression to emerge. Semi-structured interviews with teachers, learners and other college staff will take place as well as observation of lessons and analysis of curriculum delivery plans.

### 3.1. Size of Cohort

Given the very high levels of reform that take place regularly in the English education system, it is not uncommon for schools and colleges to delay adoption of a new curriculum initiative in order to give it chance to bed down, enabling teachers and schools to learn from the experiences of others. The BTEC Introductory qualifications attracted around 4000 entries in its first term of operation (see Table 1) of an estimated national cohort of around 78,000 full-time Level 1 learners. It is anticipated that the numbers taking the new BTEC qualifications will rise significantly in 2017/18 as legacy qualifications are phased out.

Table 1. Registrations on BTEC First Introductory Qualification November 2016.

| Sector                         | Registrations (Nov 2016) |             |
|--------------------------------|--------------------------|-------------|
|                                | Certificate              | Diploma     |
| Art and Design                 | 26                       | 137         |
| Business                       | 194                      | 235         |
| Caring for Children Under Five | 79                       | 42          |
| Construction                   | 35                       | 9           |
| Health and Social Care         | 107                      | 377         |
| Information Technology         | 160                      | 512         |
| Land-based Studies             | 26                       | 163         |
| Performing Arts                | 16                       | 44          |
| Sport                          | 51                       | 210         |
| Vocational Studies*            | 562                      | 1036        |
| <b>TOTAL</b>                   |                          | <b>4021</b> |

\* Vocational Studies blends modules from more than one sector together into one qualification.

## 4. Conceptual Framework

Despite a move towards the highly specified 'Technical Routes', recent Government policy in England (DfE, 2015a, DfE 2015b) seems to have overlooked the group of young people in this study to the extent that no specific provision has been targeted at them. The apparent assumption that Level 1 provision is little more than a subset of higher levels of technical subjects, risks leaving a large group of young people and low-educated adults without the support they need to progress to further education and employment. Whilst there may still be some need for technical qualifications at level 1 in a limited group of occupational sectors, this study acknowledges a potential gap in provision for the cohort.

In addition to the gap in provision, the pedagogical challenges faced by these 'middle attainers' (Hodgson and Spours, 2014) mean there is a very real risk that in getting this transition year wrong could result in a high number of young people with very few realistic options for progression in the following years; What may be lost in the definition of this transition year is the fact that many of the young people in this group, having had a negative school experience, are less likely than their higher attaining peers to have developed a realistic (and positive) view about what they might possibly do in work and future life (Mainwaring and Hallam, 2010); as well as lacking the basic educational means to achieve it. Put simply, the year immediately following the completion of an unsatisfactory lower secondary phase is critical; learners may not get another chance on their educational journey to remediate low achievement at school. In order to do be successful, learners need to develop the skills to learn and therefore re-engage with education.

The BTEC Introductory qualifications have been developed with the assumption that the learners undertaking them need to develop skills for learning first (metacognition), before they go on to attempt to master technical skills needed for work. It is for this reason that the level 1 curriculum may not necessarily be best defined by employers, but should instead reflect a *flavour* of the workplace.

With an FE sector already facing wide-scale institutional restructures and mergers (DfE/BIS, 2016) as well as dealing with a legacy of under investment, perceptions of under-performance of its staff and the impact of consistent 'undervalue by policy-makers' (Wilson & Wilson, 2011) there may be not be the capacity in the skills system to devise and deliver the right learning ecosystem for this cohort.

It is with the backdrop of these challenges that this study looks to evaluate the success of the qualification in its stated objective of enabling young people to develop the skills needed, not for work, but to progress to the next stage of learning.

## 5. Early Findings

At the time of writing this paper, data from one case study has been collected, further findings will be available in June 2017.

### 5.1. Research Question 1: How are current educational policies affecting these learners?

Recent changes in policy, requiring all young people to participate in education or training up to the age of 18 have resulted in an increase in young people who may be described as being disaffected enrolling on these level 1 programmes, creating some challenges in delivery of the programmes and the skill sets needed of the staff that deliver them. All learners not achieving GCSE maths and English at school are required to repeat English and maths in college until they reach a satisfactory level. This is creating particular problems for FE colleges that have struggled to recruit teachers with the necessary skills to deliver these subjects, and in particular with the desire to teach these subjects to learners with a very low level of prior attainment.

A significant number of young people on these programmes, whilst they are nominally labelled as being at level 1, may actually have an attainment profile which is well below level 1 so require a programme to be flexible and to incorporate some element of entry level<sup>1</sup> learning alongside their main level 1 programme.

### 5.2. Research Question 2: How are teachers and learners engaging with the new 'pre-vocational' approach of the qualifications?

In some traditional craft-based sectors such as construction, the change from qualifications that focus on the acquisition of technical skills to qualifications that are centred on generic learning skills is fairly significant and in these sectors it has been more difficult to 'win teachers round' to a new style of qualification.

The key successes from the teachers' perspectives have been in the flexibility of the delivery model which enables the mandatory units to be delivered across several programme areas at the same time, enabling learners to have a wider choice of optional sector-focused units and therefore keeping them interested and motivated throughout the year. This also means that they have a wider choice of progression options on completion of the course.

It was widely acknowledged that in all sectors that teachers needed to be specifically trained and 'really want' to teach these learners who could often be a demanding group. This was particularly true now that recent funding policies had led the college to adopt class sizes of up to 24, which are considered large for level 1.

### 5.3. Research Question 3: What approaches are being used for delivery and continuing professional development (CPD) for staff?

As the qualification is entirely focussed on preparing learners for their next stage of learning, many teachers wanted to give learners a chance to try out higher level study before the end of the year. In order to do this, they compressed the year into two terms, completing the Level 1 work intensely by April. Following this, if they were deemed to be ready, using the third term to start some work for the next level up. The teachers saw that this gave the learners several advantages. Firstly, the tutors from the Level 2 courses had the opportunity to 'audition' the learners to see if they were suitable for the course and therefore enable them to put additional support in place if required for the following year. Learners got the chance to leave the 'safety' of level 1 and try out the next level of study, whilst still maintaining the contact and support they have had from their level 1 tutor throughout the year.

Work placement was widely regarded as the most valid form of delivery for some of the curriculum areas and was seen as especially important given that many of the learners may not have the experience of working parents. Where work placement was available, such as in the college's own hair and beauty salon or restaurant, the flexible nature of the qualification meant that it was easy to fit the classroom work around the placement. The college did acknowledge however, that finding suitable placements locally was a huge challenge, as despite significant local skills shortages, many employers were looking for learners with a higher attainment threshold to take part in placements than these learners had. It was noted that learners on these programmes, possibly because of their 'limited horizons' were often not willing to travel far for placement, partly because they were unused to independent travel and

partly because of the prohibitive costs of public transport into London. The college staff suggested that they would have to ‘think creatively’ about work placement if they wanted to give every learner a chance to participate.

Due to funding limitations, there were currently no plans to schedule CPD for staff on level 1 pedagogies, instead the college would rely on attracting staff to deliver these programmes that had a desire to work with learners at this level. In respect to the new course content, it was not seen as requiring any new sector knowledge compared to previous versions of the qualification so new CPD was required for that aspect.

## 6. Concluding comments and next steps

Early responses and anecdotes from practitioners suggest that the new qualifications are successful in enabling the delivery of a flexible curriculum to a vulnerable group of learners in the context of challenging times for colleges and practitioners in England. A deeper dive is now needed to measure the impact more precisely of the development of progression skills within the context of a pre-vocational curriculum, and specifically the impact that this has on learners.

In order to do this a stratified sample of students will need to be tracked as the progress into their second year of upper secondary where they are anticipated to specialise in a technical route. In an ideal world, these learners should be, broadly speaking, on a par with those a year younger who are joining the technical route at level 2, having achieved the necessary grades at school.

During the academic year 2017/18 a deeper dive will be carried out looking at the progress of a sample of learners who have completed the qualification as they move on to level 2 provision.

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<sup>i</sup>Entry level is a broad continuum that sits beneath Level 1 and serves a broad spectrum of learners including those with learning difficulties and disabilities.

## REASONS WHY STUDENTS LOST INTEREST IN STUDYING

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### Abstract

When explaining success or failure in second language learning, “motivation” tends to be the focal point for teachers and students alike. This paper is based on my experience teaching TOEFL-ITP materials to two cohorts of university English language learners over one year (April 2015 to January 2016). Interestingly, one group retained their initial motivation towards English learning and some of the students in that group even increased their motivation as time went by. On the other hand, the other group lost their interest by the end of the semester. Attitudinal differences such as consistently being late for class, missing a class, not taking notes when necessary and sitting towards the back of the classroom frequently occurred. What could be the reasons for these behaviors? By the same token, my feelings and attitudes towards the learners who acted out in class were also negatively affected. In short, where my class of motivated students was concerned, my motivation level went up, whereas towards the other class, my motivation level went down. Were changes in my attitude a reflection of the students’ motivation, or was low motivation in the students a result of my pedagogy? In other words, did my teaching demotivate the students to the point where their negative response caused me to lose motivation, too?

**Keywords:** *Motivation, intrinsic motivation, extrinsic motivation, ideal L2 self, ought-to self.*

### 1. Introduction

In the college where I work, all the first-year students who want to take English must take a placement test on April 2 every year in order to match the students to classes at their appropriate level of ability. Among these students, those whose score is high (top 5% of all the test-takers) and those who want to study English seriously are allowed to be in a Special English Class. Simply put, those who are in the Special English Class are considered to be the elite students.

As compulsory English classes, they study English I (TOEFL intro) and English II (integrative skills) twice a week respectively in the spring semester; English III (TOEFL) and English IV (integrative skills) twice a week respectively in the fall semester. In addition, they take other core classes such as Modern World History, Modern Japanese History, Introduction to International Relations and Introduction to International Culture all in English, whereas those who are not in the Special English Classes study those subjects in Japanese.

Therefore, as a basis of this study, it is important to keep in mind the fact that the students who are in the Special English Class are quite motivated to study English and other subjects completely in English.

### 2. Background

In the academic year 2015-16 there were two Special English classes (E1 and E2), composed of 14 and 19 students respectively. Based on the three TOEFL ITP<sup>1</sup> tests they took, Table 1 below shows the details of their English level.

*Table 1. Students' TOEFL ITP score.*

|    | Apr top | Apr mean | June top | June mean | Dec top | Dec mean |
|----|---------|----------|----------|-----------|---------|----------|
| E1 | 470     | 458.8    | 510      | 464.1     | 520     | 463.1    |
| E2 | 503     | 469.8    | 540      | 474.5     | 547     | 478.6    |

<sup>1</sup>TOEFL ITP stands for Institutional Testing Program. It is composed of previously administered TOEFL® PBT (Paper-based Test) questions. It evaluates the test-takers' academic English skill levels in three areas: Listening Comprehension, Structure and Written Expression, and Reading Comprehension

As Table 1 shows, when they were divided into two groups in April, the average score of E2 was higher than the other group. It also indicates that the gap between the two groups narrowed in June, whereas the gap between the two widened by December. Proportionally, it can be seen that the students' average TOEFL score dropped in the E1 and increased in the E2.

In an effort to explain the correlation between their English test score and the motivation level, Al-Bustan & Al-Bustan (2009) stated that acquiring high test scores is a prevailing motivation for most learners. In addition, in their study of the influence of affective factors on the performance of Arab EFL Learners, Midraj, et al. (2008) demonstrated that motivation significantly determines scores in the language proficiency test. In this paper, motivational factors reflecting their TOEFL scores, are covered in the next sections.

Some reasons why the students want to enroll in a Special English class are listed below:

1) Studying abroad is one of my goals to achieve. Being in this class, I think I can make my dream come true.

2) If there's a chance to be in this class, I want to take it.

3) I want to be a teacher of English. In order to be a teacher, I have to brush up on my English and I think joining this class is a shortcut to achieve my goal.

4) I'm a returnee, so I want to use English as much as possible.

5) I love languages. I was in Sweden until I was 10. Now I want to study English and Spanish in this university.

6) I'm Chinese and my Japanese isn't great. If I can study English in English, that'll be great.

As these comments clearly show, those who applied for the Special English Class at the beginning of the year were extremely motivated to learn and improve English and for other languages as well.

### 3. Analysis

Before delving into the details of their motivation, there is one important point that needs to be touched upon. The TOEFL-making company, Educational Testing Service (ETS) (2012), asserted that its testing instrument has the following advantages: (1) being a highly reliable measure of English-language proficiency; (2) being based on more than 40 years of world-class, scholarly research; (3) having the most objective scoring methods; and (4) being built to the highest psychometric standards. However, except for ETS's claims, very little objective research-based evidence has been found to affirm the reliability of this instrument.

On the other hand, scholars such as Al-Musawi (2001) found out that TOEFL scores were not a reliable predictor of students' academic success. Similarly, Ng (2008) reported that no significant relationships were found for the TOEFL scores and number of ESL courses in relation to GPA, course completion and retention rates.

Therefore, in this paper, I would like to point out that students' TOEFL ITP scores should be considered as an indicator of the learner's ability, not a measure of their English proficiency.

#### 3.1. Self-Determination Theory and L2 Motivation Self-System

In order to observe the motivational differences between the two groups, several sets of questionnaires were utilized. First is the one based on the Self-Determination Theory (SDT; Deci & Ryan, 1985) and L2 Motivational Self System (L2MSS; Dörnyei, 2005). According to the SDT, there are two different types of motivation: intrinsic motivation<sup>2</sup> and extrinsic motivation<sup>3</sup>.

The L2MSS consists of the following three components (Dörnyei, 2010):

1. Ideal L2 Self, which is the L2-specific facet of one's ideal self. If the person one would like to become speaks an L2, the ideal L2 self is a powerful motivator to learn the L2.

2. Ought-to L2 Self, which concerns the attributes that one believes one ought to possess to meet expectations and to avoid possible negative outcomes.

3. L2 Learning Experience, which concerns situated motives related to the immediate learning environment and experience (e.g. the impact of the teacher, the curriculum, the peer group, the experience of success). (pp. 79-80)

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<sup>2</sup>Intrinsic motivation deals with behavior performed for its own sake in order to experience pleasure and satisfaction, such as the joys of doing a particular activity or satisfying one's curiosity (Dörnyei, Z., & Ushioda, E. (2011)).

<sup>3</sup>Extrinsic motivation involves performing a behavior as a means to some separable end, such as receiving an extrinsic reward (e.g. good grades) or avoiding punishment (Ibid., p.23).

In the first lesson of each class in April 2015 and the last lesson in January 2016, based on these two theories, in order to measure how much they are interested in learning English and grasp how their answers vary, the same questionnaires were distributed to all the participants. The questionnaire consists of 20 five-point Likert scaled items. The constructs are (a) intrinsic motivation, (b) extrinsic motivation, (c) ideal L2 self, (d) ought-to L2 self and general statements related to their interests in English learning. Students were asked to read the statements and choose the number that best matched their opinion of each statement: 1. strongly disagree; 2. slightly disagree; 3. neither agree nor disagree; 4. slightly agree; or 5. strongly agree. Table 2 below shows the detailed result of 14 questions they were asked.

Table 2. Criterion measures<sup>4</sup>.

|   | April 2015     |                | Jan 2016       |                |
|---|----------------|----------------|----------------|----------------|
|   | E1             | E2             | E1             | E2             |
| 1. I enjoy learning English very much. <General Statement>  | 4.44<br>(1.11) | 4.53<br>(1.23) | 4.35<br>(1.22) | 4.58<br>(1.45) |
| 2. I like listening to English speech / songs. <Listening Interest>   | 3.33<br>(1.24) | 3.50<br>(1.25) | 3.36<br>(1.22) | 3.64<br>(1.37) |
| 3. I like reading English articles / books. <Reading Interest>  | 3.21<br>(1.21) | 3.25<br>(1.40) | 3.15<br>(1.18) | 3.22<br>(1.33) |
| 4. I like speaking to people in English. <Speaking Interest>  | 3.89<br>(1.32) | 4.21<br>(1.33) | 4.01<br>(1.54) | 4.24<br>(1.45) |
| 5. I like keeping an English diary. <Writing Interest>  | 2.55<br>(1.29) | 3.01<br>(1.38) | 2.21<br>(1.02) | 2.79<br>(1.33) |
| 6. I like English movies. <Listening / Watching Interest>   | 3.82<br>(1.32) | 3.86<br>(1.34) | 4.05<br>(1.45) | 3.99<br>(1.75) |
| 7. I like the challenge of difficult tasks such as expressing myself entirely in English. <Intrinsic Motivation>  | 3.23<br>(1.27) | 3.64<br>(1.25) | 3.05<br>(1.22) | 3.75<br>(1.32) |
| 8. I am excited when I have accomplished a difficult task in English learning. <Intrinsic Motivation>             | 3.69<br>(1.57) | 3.78<br>(1.28) | 3.78<br>(1.44) | 3.93<br>(1.33) |
| 9. It is very challenging to communicate with native speakers of English. <General Statement>                     | 2.89<br>(1.43) | 2.62<br>(1.42) | 3.02<br>(1.57) | 2.77<br>(1.41) |
| 10. In order to study abroad, my English achievement (i.e. a high TOEFL score) is crucial. <Extrinsic Motivation> | 3.76<br>(1.06) | 3.27<br>(1.22) | 3.95<br>(1.22) | 3.38<br>(1.62) |
| 11. English is important to me because it will broaden my view. <Extrinsic Motivation>                            | 4.01<br>(1.25) | 4.22<br>(1.34) | 4.32<br>(1.15) | 4.45<br>(1.43) |
| 12. Being able to speak English will add to my social status. <Extrinsic Motivation>                              | 3.23<br>(1.56) | 3.64<br>(1.65) | 3.22<br>(1.56) | 3.78<br>(1.54) |
| 13. I imagine myself as someone who is able to speak English fluently. <Ideal L2 Self>                            | 3.33<br>(1.35) | 3.48<br>(1.39) | 3.12<br>(1.22) | 3.33<br>(1.32) |
| 14. Mastering English is necessary because my parents expect me to do so. <Ought-to L2 Self>                      | 2.35<br>(1.47) | 2.45<br>(1.42) | 2.55<br>(1.45) | 2.47<br>(1.44) |

Now, let me further look at each section of April 2015. The answers to Qs 1 through 6, clearly indicate that those who are in the English Special classes like learning English and in particular, students in E2 are more interested in and keen on learning English. Compared to the manner in which these students are exposed to English, their reactions vary. In all four skills (listening, reading, speaking and writing), students in E2 use their skills more often.

By the same token, as Q 9 indicates, more students in E1 feel that it is very challenging to speak to native speakers of English. However, as Kirkpatrick (2010) contends that the idealized native speaker is becoming less relevant as a model for L2 learners and that a capacity for communication with other L2 users is becoming far more valuable (cf. Cook, 2005), students should not be afraid of speaking English even if they do not sound like a native speaker of English.

Based on the answers to Q 10, students in E2 were more likely to study English for the sake of simply studying English, not for the purpose of getting a high(er) score in the TOEFL exam. In other words, those who are in E1 are more extrinsically motivated to study English.

In reviewing the answers to Q 13, more than half of the students in both groups feel that they will be able to speak English fluently. Furthermore, the participants with clear and specific vision of ideal selves have shared that they want to travel to English speaking countries which has enabled them to practice English language as much as possible. In other words, their motivation to be able to speak

<sup>4</sup>For each item, Table 2 provides the items' mean and the standard deviation (the one in brackets).

English fluently has been conducive for them to interact with people in English and feel themselves as one among them.

Finally, looking at the answers to Q 14, less than half of the respondents in both cohorts are driven by parental pressure in order to study English, which implies they are intrinsically motivated to be in the Special English class and want to improve their language proficiency.

Comparing the results of January 2016 to the ones in April 2015, there are some aspects which need to be analyzed. Looking at the results of Qs 7 and 8, intrinsic motivation of the students in E2 increased. Interestingly, looking at the results of Qs 10, 11 and 12, extrinsic motivation of both cohorts rose over one year. One reason for this was to get a good TOEFL score in order to apply for study-abroad programs. In addition, the scores of their Ideal L2 Self dropped in both classes; however, the scores of their Ought-to L2 Self rose. About this result, Dornyei (2009) explains that “the desire to reduce the discrepancy between our actual and ideal selves” (p. 29) leads the L2 learners to pursue further learning. Ideal L2 self is significantly powerful when the image is specific and detailed (Al-Shehri, 2009). Therefore, both groups dropping their Ideal L2 score suggests that their image becomes blurred. Compared to the ideal L2 self, ought to L2 self is inspired by a negative future that a learner wants to avoid. Hence, both cohorts raising their Ought-to L2 self indicates that they start to have an image where they want to prevent troublesome outcomes.

#### **4. Discussion**

A key question which shows some interesting aspects was “compared to the time you joined this class in April, did your motivation level go up or go down and why?” Six out of 14 students in E1 responded that their motivational level dropped as time went by, whereas none of the students in E2 said their motivation level went down.

##### **4.1. Negative Feedback from E1**

Here are some of the negative reasons they gave, and my reactions to each response:

1) “This English class was totally fine, but studying other core classes all in English was really tough for me and those subjects badly affected my GPA.”

- About half of the students mentioned the low GPA score as a reason. And a few of them decided to voluntarily drop out of the class when they became a second-year student.

2) “I expected this class to be more communicative, so I was a bit disappointed to be in this class.”

- Looking back, comparing to how I taught in E2, I did not make digressions much and do some ice-breaking activities during class simply because I felt students did not fully enjoy learning.

3) “This class starts at 9:00. After I started my part-time job, it became very tiring to come to class on time.”

- As a class policy, students will be considered absent if they are more than 20 minutes late for a period. However, some students took advantage of this rule and came almost always late for times up to but not including the 20 minute cut-off point.

As for the comments of students who showed disappointment with the class because they did not have enough opportunities to use English, Zeng & Murphy stated that most teachers spend more time teaching grammar and language points, ignoring the communication between teachers and students, so students have little chance to practice English in the class (2007). However, a focal point of this class was to teach them test-taking strategies such as how to answer questions effectively within a limited time. In fact, in order to give them plenty of opportunities to use English, the English class was held four times a week: 2 TOEFL (prep) classes and 2 classes which cover 4 integrated skills. Unfortunately, some of them had the misguided expectation that TOEFL classes were to be communication-based.

Regarding the comments about English study after the summer vacation, a couple of students displayed significant lack of interest. This lack of interest in studying was displayed by the following behavior: 1) frequently coming to class late; 2) sitting towards the back of class; 3) frequently missing classes; 4) not taking time to answer a question; 5) not doing homework; 6) taking too long to write notes, and 7) using their cell phones in class.

#### **5. Conclusion**

Unless motivation is actively maintained during the lengthy process of learning, it is quite normal for the students to lose sight of the goal and get bored with an activity. That is why their initial motivation decreases.

In the field of education, the general consensus is that motivation functions in a cyclical relationship with learning and is theorized in terms of positive cycles or negative cycles which involve positive cycles linearly shown as: high motivation → high achievement → high motivation; while the negative cycles are shown as: low motivation → low achievement → low motivation (Dörnyei & Ushioda 2011). Apparently, at the beginning of the semester, all the students' motivation level was high enough; however, especially after the summer vacation, low achievement scores were driven by such reasons as their low GPA score in their other classes, poor health, and the interference of late night part-time jobs.

In conclusion, it is safe to say that my attitude was also affected by the students' attitude. When they were "up", I was "up". When they were "down", I was "down". Therefore, future research should examine the relationship between motivational strategy and engaging teaching techniques.

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## **BILINGUAL LATINO TEACHERS: EXPERIENCES OF LANGUAGE SHAME AND LOSS IN THE TEACHING OF ELLS**

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### **Abstract**

Bilingual teachers come into the workplace with a plethora of language capital, language registers, and language varieties as well as cultural understanding associated with knowing more than one language. Such expertise and capital can be used to promote positive well-being and language bridging for bilingual and plurilingual newcomers in mainstream schools. While the European Union has promoted language policies that promote plurilingualism, instances of home language restriction in schools has occurred. Primary language restriction is historically charged in the United States. English-only policies enacted as early as the 1850s serve as reminders that other languages will not be tolerated. These sentiments were reflected in more recent legislation, Proposition 227, which was passed in California in 1998. While the proposition has been repealed through the recent passage of Proposition 58 in 2016, it has negatively influenced educator and administrator decisions about primary language use and support in mainstream classrooms. The intent of this multiple case study was explore Spanish-English bilinguals lived experiences utilizing their primary language as ELL children and as adult bilinguals teaching in predominantly Latino populated mainstream classrooms. The goal was to determine what types of language experiences shaped their images about themselves as children, whether those experiences have changed or are similar to those of their childhood. Participants were recruited from the Bilingual Authorization credential program at an urban university in Southern California. Eight participants out 14 volunteered to participate. Data were collected from journals, interviews, and artifacts over a period of two years from the point in which teacher participants were interviewed for participation in the Bilingual Authorization Program and after they received the credential. The data corpuses were transcribed and reviewed for recurring themes and patterns. Salient themes converged based on participant childhood schooling and adult teaching experiences including: institutional language shaming, institutional instigated language loss, family-supported language pride, and family-supported language retention. Bilingual teachers reported adult home language shaming by some educators and administrators in schools. Native language use was discouraged or criticized. Teachers were encouraged to provide English Learner newcomers with English-only approaches and resources in the classrooms. All experienced some type of discouragement, language shaming, and a couple experienced inklings of possible job loss at their school sites which prevented them from providing primary language support for Spanish-speaking newcomer children. Implications for administrators and educators are addressed.

**Keywords:** *English Language Learners (ELLs), bilingual education, English-only policy, language loss, teacher education.*

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## **YOUTH BULGING IN SOUTH AFRICA: THE ROLE OF ENTREPRENEURSHIP EDUCATION IN THE SCHOOLING SYSTEMS**

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### **Abstract**

This paper reports on the research findings on the study on youth bulging and the role of entrepreneurship education in the primary and secondary schools. This study aimed at seeking possible solutions to address political unrests, conflicts in societies and crime that emanate from youth bulging in South Africa. This research was conducted in rural and semi-urban areas in Capricorn District, Limpopo Province of South Africa. Literature on youth bulging in South Africa and the role of elementary education was reviewed and was supported by empirical study wherein 20 secondary school educators were purposively selected. Content analysis and narratives were used to analyse data, derived from interviews. The findings revealed that quality basic entrepreneurship education that is delivered by committed and competent teachers is required to curb growing youth bulging in South Africa. The findings suggest that adding entrepreneurship curriculum in the basic education from the foundation phase can help inculcate within the South African children basic entrepreneurial skills that are required for their future full economic participation in the business and labour market. This study concludes that entrepreneurship education has a role to play in addressing a problem of youth bulging and can be used to upgrade economic development and growth of the developing country, such as South Africa. The study further recommends that the entrepreneurship education should be a core curriculum of basic education, and should be integrated in the teacher education curriculum whereas practising teachers requires training on the integration of entrepreneurship education in their subjects.

*Keywords: Youth bulge, entrepreneurship education, unemployment, poverty, economic development.*

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### **1. Introduction**

Africa faces challenges of job creation and sustainability, due to slow emerging markets and commodity price turmoil (International Labour Organisation 2016). The Southern African Development Community (SADC) region is not an exception. SADC region is unable to attain its primary objectives of stimulating the demand for labour, increase the rate of labour absorption in the economy by combating high levels of unemployment and under-employment amongst women and youth as stated in its employment strategy (SADC 2014). Instead, of improving on women and youth employment rate, SADC region experiences 50, 90% youth unemployment recorded at 50.90%. South Africa contributed 50, 80% (Trading Economics, 2017) towards SADC regions' unemployment rate, whereas, Zimbabwe recorded 80% (Mude 2014). High levels of youth unemployment in Africa result from youth population's explosion.

The alarming youth unemployment in South Africa is caused by public and private companies' failure to create job opportunities. The rocketing youth unemployment rate is affected by growing unemployment rate that reached 27, 7% in the first quarter of 2017 (Trading Economics, 2017) few weeks after its credit rating was downgraded by Standard and Poor, Fitch and Moody Investors Services. According to Trading Economics (2017), South Africa experiences the highest jobless rate since the first quarter of 2004 as unemployment rose faster than employment. The downgrading can affect South African fiscal policies because it leads to cut in government spending that will impact negatively on safety nets the government created to address problems of unemployment, poverty, and housing. The situation will hit hard on unemployed South Africans, particularly youth bulging in South Africa.

Young people with little primary education are very likely to live in poverty because they cannot find employment and they create problems for the entire society. The quality of basic and tertiary education guarantees better chances of youth to be absorbed in the labour market. The researchers believe that entrepreneurial education can be used as a possible solution to youth bulge. The alarming growing rate of youth population and their future prospects into the labour market can be addressed by entrepreneurial education, where children are exposed to business and economic world when they are still in the classroom. The use of case studies; project-based learning; simulation; and advanced classroom technological applications that promote 21<sup>st</sup> Century e-learning, e-tutoring and e-assessment strategies can help bring business and economic world in the classroom. It is believed that youth bulging promotes political unrests, conflicts in societies and crime (Bricker and Foley 2013). This paper reports on the research findings on the study on youth bulging and the role of entrepreneurship education in the primary and secondary schools. Furthermore, this study aimed at seeking possible solutions to address political unrests, conflicts in societies and crime that emanate from youth bulging in South Africa.

## **2. Review of Literature**

### **2.1. What is youth bulge?**

Youth bulge is defined by Schomaker (2013: 116) as a term commonly used when the young people between 15-24 year olds in a society are larger and exceeds 30% of the population. In addition, Idrees, Shabbir, Roman and Atif (2015: 1005) describe youth bulge as a demographic expression used to describe a population in which the share of the young people is radically large in contrast to the other, older age groups. Macrothink Institute (2014: 225) gives a better picture when it highlights that youth bulge is a phenomenon associated with the developing countries, especially those that achieved some success in reducing infant mortality, but still with high fertility rates. Youth population explosion that results with youth bulge occurs due to high natality rate and low mortality rate as a result of developed medical and health sciences. Youth unemployment occurs when the unemployment rate of youth is greater than employment rate.

Unfortunately, the situation is more prominent in the developing countries where high rate of youth population results with youth bulge that is referred to as demographic bomb (Yin, 2012), because most often than not, it results with political unrests, conflicts in societies and crime. Yin (2012) highlights that if a large youth population that is ready to enter into labour market cannot be absorbed, it becomes a demographic bomb. The use of prudent fiscal policies that will trigger public and private sectors to assimilate more youths into the job market is required to turn the predicted demographic bomb into demographic dividend.

### **2.2. Causes of youth unemployment in South Africa**

Despite the fact that many factors have played important roles in countries' political and economic instabilities, such as; police brutality, important historical events, new social media, and social tensions, there are specific factors that contributed to South African political and economic instabilities. The factors such as; power-monger; self-enrichment; financial embezzlement, and fraudulent and corruption activities are cause for concern.

The high levels of youth unemployment in South Africa are the effects of political immaturities and the stated factors. The education crisis in South Africa is a crippling factor towards the full economic participation by the youth from the previously disadvantaged communities. The unattended youth, which continues to grow at the alarming rate causing youth bulging is really a ticking bomb ready to explode. The participation of youth in service delivery contests, political unrests, xenophobic attacks and property vandalism is the clear indication of youth negligence. Similarly, the Middle East and North Africa youth unemployment resulted from low economic activities due to political unrest and domestic terrorism (Schomaker, 2013: 116).

### **2.3. Entrepreneurial Education**

Leighton Andrews, Minister for Education and Skills in Welsh Government highlights the Department's need to create an entrepreneurial spirit among the pupils of our schools, colleges and universities, as this groups are the key to the future of the Welsh economy (Government of Wales, 2012: 2). This extract emphasises the significance of entrepreneurial education in the creation of future prospects for children and country at large. Manpower Group (2012) identified four key barriers to youth employability, namely; lack of information, networks, and connections; lack of relevant skills; lack of experience credentials; and lack of available entry-level jobs with career potential. Van Zyl (2006)

highlighted that there is no enthusiasm and commitment to entrepreneurship in schools, because of the inclusion of curriculum policies that result with very few job opportunities for those who cannot go beyond grade 9. In the Mopani Education District, some circuits have stripped off the commerce stream that is expected to provide entrepreneurial education to children from deep rural communities of Limpopo Province.

### **3. Empirical Study: Capricorn District in Limpopo, South Africa**

This research was conducted in rural and semi-urban areas in Capricorn District, Limpopo Province of South Africa. This area was selected on the basis that it experiences low economic development; and high unemployment and poverty.

#### **3.1. Research design and methods**

The qualitative case study was adopted in this study. The rationale to use a case study rest with its contribution to knowledge in relation to individuals, groups, social, political and related phenomena (Yin 2008: 4).

A purposive sampling was used to achieve a sample for this study. Interviews were used as primary data, and were conducted on 20 primary and secondary school educators. Document study was used as a secondary data collection instrument to supplement information received from interviews. Content analysis was used to analyse data, derived from interviews.

#### **3.2. Findings**

The study reveals that unemployment is high amongst people living in rural and semi-urban areas in Capricorn District, Limpopo Province of South Africa. Data from school records indicates that parents and guardians of students in case schools are coming from poverty stricken households. Despite the fact that such parents and guardians are looking for job opportunities, public and private sectors fails to absorb them. Their means of survival is social and pension funds. Furthermore, the study further reveals that unemployment affected both young and old. However, women and youth were found to be in majority.

The educators are convinced that the provision of quality basic entrepreneurship education that is delivered by committed and competent teachers is required to curb growing youth unemployment in South Africa. The findings suggest that adding entrepreneurship curriculum in the basic education from the foundation phase till further education and training phases can help inculcate within the South African children basic entrepreneurial skills that are required for their future full economic participation in the business and labour market. Department of Education is urged to provide 21<sup>st</sup> Century entrepreneurship curriculum for all grades that is well articulated in the Curriculum and Assessment Policy Statement.

### **4. Conclusion and Recommendations**

This study concludes that entrepreneurship education has a role to play in addressing a problem of youth unemployment that was caused by youth bulging in SADC and South Africa in particular. The study recommends that the entrepreneurship education should be a core curriculum of basic education, and should be integrated in the teacher education curriculum whereas practising teachers requires training on the integration of entrepreneurship education in their subjects. The study further recommends that the Department of Higher Education and Training should provide highly skilled and competent educators to teach entrepreneurial education from the foundation phase up until tertiary education.

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# USING AN APP AS A LOG TO COLLECT DATA ABOUT THE FEEDBACK PERCEPTIONS OF FIRST YEAR EAL (ENGLISH AS AN ADDITIONAL LANGUAGE) UNDERGRADUATE STUDENTS

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## Abstract

International education is considered the third largest export industry in Australia. An increasing number of international higher education students are choosing Australia as their destination. Many are English as an Additional Language (EAL) students, who come with different cultural backgrounds and diverse previous learning experiences. Thus, several universities have been looking carefully at how to ensure that these students, for whom English is not their first language, develop the skills that allow them to engage and complete their studies successfully. Assessment for learning is seen as an important way of enhancing and promoting students' learning. Feedback, which is considered part of the assessment for learning process, is recognized as beneficial to students' learning. This investigation is qualitative in nature aiming to understand how students perceive and use feedback. Data collection methods included interviews and the completion of a log using an app. The app enabled an intensive investigation of specific experiences of EAL students receiving feedback. Using the app enabled an exploration of the landscape of feedback from the EAL students' perspective, including the sources of feedback, how much they learnt from the feedback, and what was the feedback about. The findings have implications for universities to facilitate success for international students as the data from the app revealed students' behaviours, preferences and perceptions of the feedback. Feedback from peers and tutors were equally ranked in terms of contributing to their learning process. Lecturers were the least source they received feedback from.

**Keywords:** *Feedback, international students, higher education, EAL (English as an Additional language).*

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## 1. Introduction

Australia has the third highest population of international students in the world (Liddell & Brydon, 2012). Different investigations have been trying to develop different strategies to support international students in higher education (Dunworth, 2010; Murray & Nallaya, 2014). This paper seeks to investigate the landscape of feedback from the EAL students' perspective. It identified the sources, and formats of feedback students received.

In the last decade there has been important attention given to formative assessment, which is assessment that is designed to provide feedback and support for learning (Black & Wiliam, 1998). As indicated by Sadler (2010), "too much attention has been paid at the micro level within the traditional model: what the teacher can do to construct more effective feedback, and what the learner should do to make more use of the feedback provided" (p. 547). This paper explored feedback experiences from all sources that occurred both in formal and informal settings (Sambell, McDowell, & Montgomery, 2012).

## 2. Design

A qualitative approach framed this investigation in which the following design principles were embedded in the use of an app from interpretivist assumptions as a way of collecting the data:

**Oriented on the processes involved in feedback:** A digital log was developed and completed by the students to capture their experiences across time, by following them along the way of receiving feedback about any of the courses that they were taking at the university, considering all sources, such as friends, academics, housemates, relatives, etc. A digital log was completed by the EAL students' participants for a period of a month and it was followed up by the second interview to seek further

clarification about this process. The digital log allowed the researcher to follow the students and capture real time data in situated contexts to portray students' actual experiences of feedback

**Effectiveness of feedback:** This inquiry was designed to capture all types of feedback that students received about the courses they were taking at the university, including all forms of feedback: conversations, written feedback, emails, general comments, etc.

### 3. Objectives

This digital log aimed at providing valuable data about the participants' preferences and experiences in relation to feedback. Furthermore, it forms part of the researcher's understanding of the social context embedded in feedback, including information about the interaction, and outcomes from that interaction. The data from the digital log allowed the researcher to look for patterns among the participants in relation to different ways of interpreting feedback. As this research considered a socio-constructivist paradigm, after the log was completed a second interview was organized where several questions were asked about the digital log completion in order to analyze how the participants interpreted the information from the log and their ways of knowing and understanding in relation to their experiences completing the log.

### 4. Method

Participants completed a digital log answering multiple choice questions for one month in relation to their feedback experiences. The digital log was developed through an app that allowed the students to install it in their smart phones and have access to it any time. The researcher was able to track students' entries constantly as participants had to enter their pseudonyms when completing an entry to be identified by the researcher, and after submitting their answers an email was automatically sent to the researcher's email account with all the information. Multiples and an uneven number of entries were entered in the log, depending on the number of pieces of feedback participants received during that month. As such, each participant could nominate more than one source as they had multiple opportunities.

### 5. Discussion

A total of 43 entries were entered in the electronic log, ranging from one to eight entries per student in a period of one month. The information was grouped according to the sources of feedback that the students entered: feedback from tutor, lecture, and friends/classmates/relatives/housemates. The vast amount of feedback that students received was from tutor and friends/classmates/relatives/housemates. Few entries were entered about feedback from the lecturer. Furthermore, the data related to how much they learned from the feedback revealed that in average the learned the same from tutors and friends/classmates/relatives/housemates. A lower score was entered in relation to the feedback received from the lecturer. Entries showed that most of the feedback students received from the tutor and lecture was mainly organized by tutor or lecture. Little initiative from participants was taken to obtain feedback from tutor and lecture. An unexpected outcome from the log was the unawareness and uncertainty about the notion of informal feedback, specially from informal situations.

### 6. Conclusions

This paper sought to examine first year EAL (English as an Additional Language) undergraduate students behaviours, preferences and perceptions of feedback using an app as an instrument to collect the data. The data showed that greater instruction and explanation should be provided to the EAL students about the notion of feedback to create greater awareness and understanding of its meaning and importance. Tutor and friends were considered as the main sources of feedback for first year EAL international students, being the lecture the least source addressed by the students. More research is suggested about the role of the lecture as a source of feedback. The significance of feedback from tutors and friends were equally ranked by the students. This paper also highlighted the importance of peers for first year EAL international students in their learning process, and supported the notion of embedding a socio constructivist approach in feedback which has already been presented by other researchers (Orsmond, Merry, & Handley, 2013; Price, O'Donovan, & Rust, 2007; Rust, O'Donovan, & Price, 2005).

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## EXAMINATION OF THE EMPLOYMENT HOPE LEVELS OF TURKISH CONSERVATORY STUDENTS

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### Abstract

The purpose of this study is to examine the employment hope levels of Turkish conservatory students in terms of different variables. Descriptive survey model was used in the study. The study group was comprised of 344 conservatory students in Turkey during 2015-2016 school year. "Employment Hope Scale" was the data collection tool. The data obtained from this inventory and "personal information form" which was prepared by the researcher were analyzed by independent sample t-test, one-way analysis of variance (ANOVA) and Welch test. According to the results obtained the psychological empowerment ranking of the Turkish conservatory students in the study vary across the age and the department. Goal-oriented pathway ranking of the Turkish conservatory students in the study vary across the department and the instrument.

**Keywords:** *Conservatory students, music education, employment hope, hope.*

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### 1. Introduction

Sociological, psychological and philosophical researches confirm the main existence condition of a human being fulfilling the main condition of humanity which is being part of a productive and value creating work and thus confirming its own nature and justifying it in a way. People can't create works of art if they don't work and thus prevent the occurrence of the conditions providing the existence and development as a human and quit from the existence as a human in a way. Unemployed life causes different damages in the psychological, physical, social and philosophical existence of a person. The individual tries to foresee the future in advance in order to prepare positive conditions and wants to form the near future according to his/her own hopes and wishes as far as s/he can see (Navaro, 2014). Hope is seen as one of the factors which may affect the fulfilling of career development tasks of an individual and career related behaviour and experiences. In recent years, it is emphasized that hope, especially the needs for career accordance in career environments with dynamic and uncertain conditions, psychological strength, hope and optimistic attitudes are demanded a lot (Kepir-Savoly, 2016).

Similar to hope, employment hope has a two-dimensional structure: Psychological empowerment and goal-oriented pathway. Psychological empowerment which is the first dimension of employment hope represents the confidence of an individual in his/her abilities within the context of self-respect and self-sufficiency. Goal-oriented pathway which is the second dimension of employment hope means the opportunities available to reach the goal. Employment hope concept occurs when the self-sufficiency confidence and the ways which would help the individuals to reach their goals combine (Akın et al, 2013). Psychological empowerment dimension includes the decision of an individual for being capable of reaching his/her goals and making plans for this. Goal-oriented pathway dimension includes the confidence of the individual that s/he can find the desire and ways to reach these goals when s/he determines new goals based on past experiences (Kepir-Savoly, 2016).

Individuals choosing music as their profession in Turkey take education in undergraduate level in conservatories, fine arts faculties, art and design faculties and faculties of education. In line with their own choices, students who take and succeed in the special talent exams of these schools start their occupational music education lives. They can have different occupational goals, opinions and motivation levels on these goals. But employment hope levels of these students are unknown. No studies on job orientation, job finding, confidence and goals for employment and employment hope levels were found in literature. The objective of this study was to examine the employment hope levels of individuals being educated in undergraduate level in the conservatories in Turkey in some variables. It is considered that a contribution can thus be provided to literature. Unknown employment hope level of conservatory students in undergraduate level constitutes the problem of this research. Sub problems of the research are mentioned below:

1. Does the employment hope levels of conservatory students change according to gender variable?
2. Does the employment hope levels of conservatory students change according to age variable?
3. Does the employment hope levels of conservatory students change according to department variable?
4. Does the employment hope levels of conservatory students change according to individual instrument variable?

## 2. Method

This study examining the employment hope levels of students being educated in occupational music field is a descriptive study where scanning model is used. Scanning model includes the research approaches aiming to describe a past or present condition as it is (Karasar, 2005). 344 students taking conservatory education in undergraduate level in 2015-2016 education year in Turkey constitute the study group of this research and these students continuing their education in the following universities' state conservatories were reached through suitable sampling type: Bülent Ecevit University (Zonguldak), Dicle University (Diyarbakır), Fırat University (Elazığ), Gazi University (Ankara), Karadeniz Technical University (Trabzon), Mimar Sinan University of Fine Arts (İstanbul), Niğde University (Niğde), Sakarya University (Sakarya). 46.2% of the study group were female and 53.8% were male. 26.5% of the study group were in 18-20, 37.8% in 21-23, 16.6% in 24-26 and 10.5% in 27-29 age groups and 8.7% were in the group of participants aged 30 and above. 5.2% of the study group were taking education in Music, 30.2% in Basic Sciences, 15.1% in Musicology, 5.5% in Performing Arts, 17.7% in Turkish Music, 11.3% in Vocal Training, 9.9% in Turkish Folk Dances and 4.9% in Instrument Training departments. The distribution of the individual instruments is as follows in the study group: 20.9% bağlama, 18% violin, 9.9% ud, 7.6% kanun, 6.4% guitar, 6.1% clarinet, 5.8% singing, 5.2% ney, 4.7% tanbur, 2.6% kaval, 2.6% kemence, 2.3% mey, 2% violoncello, 1.7% kabak kemane, 1.2% viola, 0.9% piano, 0.9% flute, 0.6% double bass, 0.6% tar.

Two data collection tools were used in the research. The first was the personal data form prepared by the researcher in order to acquire the personal data of the students taking occupational music education. Questions on variables such as gender, age, school, department and individual instrument are available in this form. "Employment Hope Scale" was used in the research in order to collect data on the employment hope levels of the students. This scale developed by Hong, Polanin and Pigott (2012) has 14 items and two sub scales: Psychological empowerment (4 items) and goal-oriented pathway (10 items). The scale is a measurement tool developed to determine employment hope levels of adults and is based on the individual providing information about him/herself. Cronbach alpha inner consistency coefficients of the scale were found as .918 for the whole scale, .792 for psychological empowerment sub-dimension and .907 for goal-oriented pathway dimension in this research. Data acquired through Personal Data Form and Employment Hope Scale were analyzed with SPSS 20.0 package program using Independent Samples t-test, One-Way Variance Analysis (One-Way ANOVA) and Welch test. Homogeneity of the variances was determined by Levene statistics. LSD test was used to determine which median differences cause the differences in conditions where one-way variance analysis result is important. Tamhane's T2 test was made for paired comparisons when Welch test was used for inhomogeneous variances.

## 3. Findings

In this section, findings for the sub problems of the research are given in tables in line with the data acquired through the scale.

### 3.1. Findings for the Difference in Employment Hope Levels of Conservatory Students According to Gender Variable

Table 1. Analysis results of psychological empowerment scores of conservatory students according to gender variable.

| Gender | N   | Mean  | Std. Deviation | df  | t     | Sig.  |
|--------|-----|-------|----------------|-----|-------|-------|
| Female | 159 | 35.06 | 5.72           | 342 | 0.144 | 0.886 |
| Male   | 185 | 34.98 | 5.27           |     |       |       |

In Table 1, there is no significant difference in psychological empowerment scores of conservatory students in employment hope scale according to the gender variable ( $p > .05$ ).

*Table 2. Analysis results of goal-oriented pathway scores of conservatory students according to gender variable.*

| Gender | N   | Mean   | Std. Deviation | df  | t     | Sig.  |
|--------|-----|--------|----------------|-----|-------|-------|
| Female | 159 | 121.00 | 19.44          | 342 | 0.794 | 0.428 |
| Male   | 185 | 119.42 | 17.56          |     |       |       |

According to Table 2, there is no significant difference in goal-oriented pathway scores of conservatory students in employment hope scale regarding gender variable ( $p>.05$ ).

### 3.2. Findings for the Difference in Employment Hope Levels of Conservatory Students According to Age Variable

Age variable was taken in five age categories as 18-20, 21-23, 24-26, 27-29 and 30 and above in the research. As the result of Levene test questioning the equity of variances according to the age variable; it was detected that  $p>.05$  findings were not homogeneous with the data, with the values of  $p=0.010$  for psychological empowerment and  $p=0.033$  for goal-oriented pathway and through Welch test, the significance of the difference was checked.

*Table 3. Analysis results of employment hope scores of conservatory students according to age variable.*

|                           |       | Statistic | df1 | df2 | Sig. | Significant Difference |
|---------------------------|-------|-----------|-----|-----|------|------------------------|
| Psychological Empowerment | Welch | 4.974     | 4   | 339 | .001 | 27-29→<br>18-20, 21-23 |
| Goal-Oriented Pathway     | Welch | 1.544     | 4   | 339 | .194 |                        |

According to Welch test, there is a significant difference in the psychological empowerment scores of conservatory students according to age variable [ $F_{(4,339)}=4,974$   $p<.05$ ]. According to the results of Tamhane's T2 test made in order to find among which groups the inner-unit differences were present, it was observed that psychological empowerment scores of the students between the ages 27 and 29 ( $\bar{X}=37.16$ ) were better than those between the ages of 18 and 20 ( $\bar{X}=33.94$ ) and the ages of 21 and 23 ( $\bar{X}=34.66$ ). There is no significant difference in goal-oriented pathway scores according to the age variable [ $F_{(4,339)}=4$ ,  $p>.05$ ].  $F_{(4,339)}=4$ ,  $p<.05$ ].

### 3.3. Findings for the Difference in Employment Hope Levels of Conservatory Students According to Department Variable

Department variable was taken in eight categories as Music, Basic Sciences, Musicology, Performing Arts, Turkish Music, Vocal Training, Turkish Folk Dances and Instrument Training in the research. As the result of Levene test questioning the equity of variances according to the department variable; it was detected that  $p>.05$  findings were not homogeneous with the data, with the values of  $p=0,00$  for psychological empowerment and  $p=0,00$  for goal-oriented pathway and through Welch test, the significance of the difference was checked.

*Table 4. Analysis results of employment hope scores of conservatory students according to department variable.*

|                           |       | Statistic | df1 | df2 | Sig. | Significant Difference  |
|---------------------------|-------|-----------|-----|-----|------|---|
| Psychological Empowerment | Welch | 3.858     | 7   | 336 | .001 | Turkish Music→<br>Basic Sciences<br>Musicology,<br>Vocal Training,<br>Turkish Folk Dances |
| Goal-Oriented Pathway     | Welch | 3.423     | 7   | 336 | .003 | Turkish Music →<br>Vocal Training,<br>Turkish Folk Dances                                 |

According to Welch test, there is a significant difference in the psychological empowerment scores of conservatory students according to department variable [ $F_{(7,336)}=3,858$   $p<.05$ ]. According to Tamhane's T2 test results done in order to find among which groups inter-unit differences are located, it

was observed that psychological empowerment scores of the students studying in Basic Sciences ( $\bar{X}=35.25$ ), Musicology ( $\bar{X}=35.71$ ), Vocal Training ( $\bar{X}=36.97$ ) and Turkish Folk Dances ( $\bar{X}=36.76$ ) departments were higher than those studying in Turkish Music ( $\bar{X}=31.31$ ) department. There is a significant difference in goal-oriented pathway scores of conservatory students according to the department variable [ $F_{(7-336)}=3,423, p<.05$ ]. According to Tamhane's T2 test results done in order to find among which groups goal-oriented pathway scores were different, it was observed that the scores of the students studying in Vocal Training ( $\bar{X}=126.51$ ), Turkish Folk Dances ( $\bar{X}=126.14$ ) were higher than those studying in Turkish Music department ( $\bar{X}=112.62$ ).

### 3.4. Findings for the Difference in Employment Hope Levels of Conservatory Students According to Individual Instrument Variable

In the research, individual instrument variable was taken in twenty categories as violin, violoncello, baglama, viola, singing, guitar, flute, ud, kanun, clarinet, double bass, piano, ney, trumpet, mey, kabak kemane, kaval, tanbur, kemence and tar. As the result of Levene test questioning the equity of variances according to the individual instrument variable; it was detected that  $p>.05$  findings were homogeneous with the data, with the values of  $p=0.089$  for psychological empowerment and  $p=0.067$  for goal-oriented pathway and through ANOVA test, the significance of the difference was checked.

Table 5. Analysis results of psychological empowerment scores of conservatory students according to instrument variable.

|                | Sum of Squares | df  | Mean Square | F     | Sig.  |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 757.186        | 18  | 42.06       | 1.433 | 0.114 |
| Within Groups  | 9538.627       | 325 | 29.35       |       |       |
| Total          | 10295.813      | 343 |             |       |       |

In Table 5, there is no significant difference in psychological empowerment scores of occupational conservatory students in employment hope scale according to the individual instrument variable [ $F(18-325)=1.433, p>.05$ ].

Table 6. Analysis results of goal-oriented pathway scores of conservatory students according to instrument variable.

|                | Sum of Squares | df  | Mean Square | F     | Sig.  |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 9724.510       | 18  | 540.251     | 1.641 | 0.049 |
| Within Groups  | 107024.325     | 325 | 329.306     |       |       |
| Total          | 116748.834     | 343 |             |       |       |

In Table 6, there is a significant difference in goal-oriented pathway scores of occupational conservatory students in employment hope scale according to the individual instrument variable [ $F(18-7325)=1.641, p<.05$ ]. According to LSD test results made in order to find among which groups goal-oriented pathway scores are different, goal-oriented pathway scores of violin ( $\bar{X}=124.43$ ) students were higher than those of clarinet ( $\bar{X}=108.38$ ) and singing ( $\bar{X}=114.50$ ) students. Also the goal-oriented pathway scores of flute ( $\bar{X}=93.33$ ) students was lower than violin ( $\bar{X}=124.43$ ), baglama ( $\bar{X}=122.41$ ), viola ( $\bar{X}=124.75$ ), guitar ( $\bar{X}=121.72$ ), ud ( $\bar{X}=117.88$ ), kanun ( $\bar{X}=121.53$ ), double bass ( $\bar{X}=128.00$ ), piano ( $\bar{X}=126.00$ ), ney ( $\bar{X}=118.00$ ), mey ( $\bar{X}=124.62$ ), kabak kemane ( $\bar{X}=126.66$ ), kaval ( $\bar{X}=126.66$ ) and kemence ( $\bar{X}=122.44$ ) students.

## 4. Results, Discussion and Conclusion

No significant difference was found in employment hope levels of conservatory students according to gender in this study. Similar results were acquired both in the study examining the hopelessness levels of art teacher candidates and the study examining hopelessness and life satisfaction of sport teacher candidates (Doğan, 2012; Gençay, 2009).

When employment hope levels of conservator students were examined according to age variable, a significant difference was observed in psychological empowerment scores and psychological empowerment scores of students in the age group of 27-29 were higher than those in the age groups of 18-20 and 21-23. This may be due to work-related self-respect and self-sufficiency levels of the music students increasing with age. No significant difference was detected in goal-oriented pathway scores according to age variable. A similar result was acquired in a study examining the hopelessness levels of music department undergraduate students and it was observed that hope sub-dimension levels didn't differ

significantly based on age (Aras, 2011). Similar results were achieved in researches by Dereli and Kabataş (2009) and Gür, Koçak and Alakoç Pirpir (2014) and the result that there was no significant relationship between age variable and hopelessness scores was reached in both researches. These results are similar to the results of the research on goal-oriented pathway scores based on age variable and are different from the results based on psychological empowerment age variable.

When employment hope levels of conservatory students were examined according to department variable, a significant difference was observed in psychological empowerment and goal-oriented pathway scores. It was observed that psychological empowerment scores of the students in Basic Sciences, Musicology, Vocal Training and Turkish Folk Dances departments were higher than those studying in Turkish Music department. The goal-oriented pathway scores of the students in Vocal Training and Turkish Folk Dances departments were higher than those in Turkish Music department. This situation may be caused by lower confidence level of the students in Turkish Music departments in their skills in scope of self-respect and self-efficiency than those in other departments and their perception of the opportunities they have to be able to reach their goals and also higher confidence levels of Vocal Training and Turkish Folk Dances students in being able to find ways to take them to their goals and targets (Kepir-Savoly, 2016). In a study examining the hopelessness levels of senior students for finding job, a significant relationship was found between the department variable and hopelessness variable for finding a job (Üstün et al, 2014). This result is similar to the results of the research.

When employment hope levels of students taking occupational music education were examined according to the individual instrument variable, a significant difference was observed in goal-oriented pathway scores, but not in psychological empowerment scores. In the research by Aras (2011), it was observed that there was no significant difference in the hopelessness levels of music department undergraduate students according to individual instrument variable. These results are similar to the results of the present research in terms of psychological empowerment dimension and are different in terms of goal-oriented pathway dimension.

It is known that the hope, life satisfaction and self-respect levels of the individuals increase with hope intervention program teaching goal-oriented thinking. Improvements are provided in individual and social well-being, career development and academic success fields by increasing hope level (Kepir-Savoly, 2016). Such psychological and educational studies can be used to increase employment hope levels of conservatory students. For improving the employment hope of the students according to the results acquired on age, department and individual instrument, it is suggested to organize activities such as trainings and seminars in the departments, provide information to the students on the jobs and working areas on the music in these activities and create academic meeting and discussion environments with the professionals in different branches of the music field. Covering different variables on the subject is also suggested.

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# SEN AND MAINSTREAM TEACHERS' PERCEPTION OF GIFTEDNESS IN ITALIAN MIDDLE SCHOOLS DO THEY EVALUATE GIFTED STUDENTS IN THE SAME WAY?

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## Abstract

Giftedness Evaluation represents a new emergent area of study in Italy. A didactic intervention starts from a good evaluation of children's potential. The assessment of children capacities is the first step of personalized didactics. Due to the lack of appropriate identification procedures, Gifted students often underachieve and do not receive appropriate instructional and educational supports. In the framework of inclusive education, the study highlights the importance of the evaluation of each student's potential in order to create didactics plans and learning experiences that fulfill their educational needs. This paper presents the result of a comparison between Special Educational Needs teachers and Mainstream Teachers in the use of the Renzulli-Hartmann Rating Scale (2010) in the Evaluation of Giftedness in three Italian middle schools in south-eastern Italy. Both qualitative and quantitative data were collected. The results show a high correlation between SEN and Mainstream teachers evaluations in each subscale (Creativity, Learning, Leadership, Motivation, Artistic Attitude, Communication-Expressiveness, Communication-Precision and Planning). However, T-students Analysis show differences in teachers' perception of Creativity, Learning and Artistic Attitude indicating the need for further studies in this way.

**Keywords:** *Giftedness, Evaluation, Teachers, Middle School, Rating Scales.*

## 1. Introduction

Every child is unique and has a potential that can be offered to the society. Gifted students are those who own a high potential in intellectual, creative, social and physical domains of human ability (Gagné, 2003). This potential can be expressed and developed into talent only with the interaction with environmental factors (school, families, significant others). According to the three ring conception of Renzulli (1986), Giftedness is also characterized by a commitment or motivation in the task.

Inclusive and learning-friendly environments should be created in every school so that all children will be motivated and enabled to develop to their academic, intellectual, social, emotional, creative and physical potentials. In an inclusive school, teachers need to serve all students, to offer them didactics methods and curriculum adjustments that suit their learning and cognitive styles. In an inclusive School also the identification processes should ensure gifted and talented students are recognized regardless of their cultural or socioeconomic backgrounds, gender, physical or sensory disability or geographic location (Department of Education, WA, 2011).

There are many techniques that teachers can use to identify the strengths and weaknesses of their students. Through a combination of qualitative (observations, parent, peer and self-nominations) and quantitative data (Rating scales, Standardised tests, School records) a teacher can build up a better understanding of their students. Well known rating scales for identifying gifted students for Gifted Programs are the Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS, Renzulli et al., 1997). An important aspect in the use of teachers rating scales, examined in a study by Elliott and Argulewicz (1983), is that the cultural context, the level of education and gender, affect evaluations of teachers significantly. As argued by Renzulli (2010) the use of Rating Scales must refer to local standards and differentiate for different grade levels.

This study wanted to examine if teachers background can affect their perception of giftedness. Teachers participated in the investigation have a graduate degree to teach at secondary school level, as well as a one-year specialisation and traineeship in schools undertaken after graduation. Support teachers owned also a specific qualification, awarded by universities that included at least 300 or 400 hours of traineeship activities related to school inclusion. It's important to highlight also that after the introduction of the Law 128/2013 compulsory in-service training was introduced for all the school staff, teachers and school principals at all school levels for pupils with special educational needs.

## 2. Experimental Design

The research method is descriptive-analytic and its design is comparative. The survey was conducted in four lower secondary schools of the Province of Lecce. A total of 259 students and 23 teachers participated in the whole investigation. The total evaluations were 412. A total of 18 teachers were mainstream teachers and 5 teachers were qualified on Special Education (two of them at the moment of the investigation were working as SEN teachers).

A subsample of 70 Students was evaluated both from the mainstream teacher and SEN teacher for a total of 140 assessments.

Through an exploratory factor analysis, factor scores were computed in order to be used in subsequent analyses. In order to determine whether the means of the Support Teachers assessment and Curricular Teachers Assessment were different the Analysis of variance (ANOVA) was used. At the same time, a Correlation Analysis was conducted to establish the direction and strength of the relationship between the evaluation of the two groups of teachers.

### 2.1. The instrument

The Renzulli Scales for the identification of Giftedness are composed of a total of 84 items by which teachers assess students on a series of observable behaviours through a Likert 6 point scale (1 = never; 2 = very rarely; 3 = rarely; 4 = occasionally; 5 = frequently; 6 = always). The distribution of the items in the individual subscales is variable. The subscales used in this study explore the following areas: - Learning - Creativity - Leadership - Motivation - Planning - Artistic Attitude - Communication (expression) - Communication (precision) - Planning.

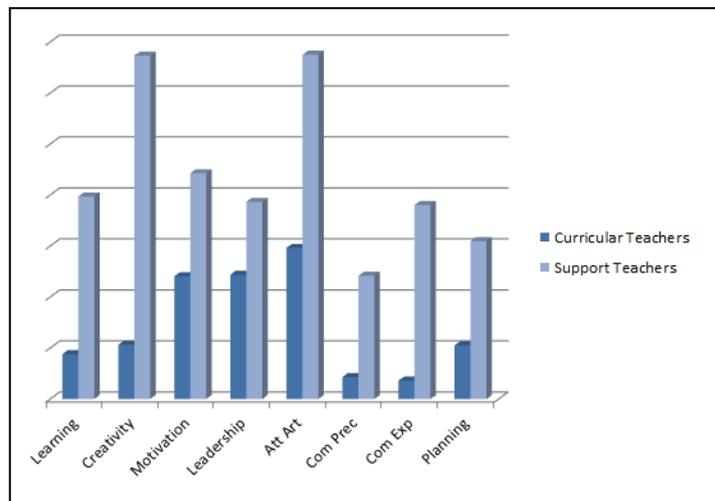
### 2.2. Results

Considering the whole sample of evaluation, only in the Subscale Creativity the F value (1, 398) = 4,6 was larger than the critical value (3.86) showing a significant difference between the means of the groups at the  $\alpha$  error level 0.05, in the whole group only for this subscale.

In the second analysis, conducted with the subgroup, 70 students had the opportunity to be evaluated twice (one evaluation from the Mainstream teacher and one evaluation from the Support teacher).

The data illustrated in Figure 1 reveal a greater willingness of Sen teachers to give higher scores to students.

Figure 1. Subscale Means from the Curricular and Mainstream Teachers Evaluations in the Subgroup of 70 Students.



In order to test whether the means of the two groups of teachers were statistically different a paired-samples t-test was used.

- Learning

The obtained T-value of (-2,65), the degrees of freedom which are (65), and the statistical significance (2-tailed p-value) of the paired t-test which is (0.010), as the p-value is less than 0.05 (i.e.,  $p < .05$ ), it can be assumed a statistically significant difference existed between the two variables (the two groups of teachers)

- Creativity

The Paired T-test was conducted with this result:  $T=-2,815$   $df=63$   $p= 0.006$ . By conventional criteria, this difference is considered to be very statistically significant.

-Motivation

The Pair T-test for the Motivation Scale gave this result:  $t= -1,804$   $gl 68$  with a  $p=0,076$ . It means that there is no difference between the evaluations of Motivation in the two groups of teachers.

-Leadership

The Paired t test conducted for the Subscale leadership lead to this result:  $T= -0,970$   $df=67$   $p= 0.335$ . By conventional criteria, this difference is considered not significant.

-Artistic Attitude

Pair T test results:  $t= 2,135$   $df 68$  with  $p=0,036$  show statistically significant difference between the two teaching evaluations.

- Communication (Precision)

The Paired t test conducted for the Subscale Communication-Precision lead to this result:  $T= -1,401$   $df=66$   $p= 0.166$ . By conventional criteria, this difference is considered not significant.

- Communication (Expressiveness)

As regard the Paired t test conducted for the Subscale Communication- Expressiveness this result was found:  $T= -1,716$   $df=67$   $p= 0.091$ . By conventional criteria, this difference is considered not significant.

- Planning

The Paired t test conducted for the Subscale Planning lead to this result:  $T= -1,701$   $df=64$   $p= 0.094$ . By conventional criteria, this difference is considered not significant.

Pearson product moment correlations were performed to analyze the relationship between the evaluation in each subscale for the two groups. The table (see table 1) presented below shows a high positive correlation in the use of all subscales for the two groups of teachers. For every subscale the correlation is strong and significant at the 0.01 level (2-tailed).

*Table 1. Correlation Between Mainstream Teacher (MT) and Support Teachers (ST) evaluation in each Subscale of the Renzulli Hartmann rating Scales.*

|   | N  | CORRELATION | SIG. |
|---|----|-------------|------|
| Learning MT & Learning ST                                     | 66 | ,863        | ,000 |
| Creativity MT & Creativity ST                                 | 64 | ,580        | ,000 |
| Motivation MT & Motivation ST                                 | 69 | ,874        | ,000 |
| Planning MT & Planning ST                                     | 68 | ,781        | ,000 |
| Artistic Attitude MT & Artistic Attitude ST                   | 69 | ,555        | ,000 |
| Communication (expression) MT & Communication (expression) ST | 67 | ,795        | ,000 |
| Communication (precision) MT & Communication (precision) ST   | 68 | ,590        | ,000 |
| Planning MT& Planning ST                                      | 63 | ,861        | ,000 |

### 2.3. Discussion

The results showed a positive and significant correlation between the Evaluation of the Mainstream teachers and Support Teachers in each Subscale for the evaluation of Giftedness.

If we considered only the Subgroup of 70 Students, in which every student was measured twice, the T-test analyses show a significant difference between the results of the evaluation of the two groups of teachers in the subscales Learning, Creativity and Artistic Attitude. On the other hand, if we considered the whole group of evaluations made by 23 teachers we see only a difference between Mainstream and Support Teacher only in the Subscale Creativity.

A qualitative data emerged during the observation is the difficulty faced by teachers in completing the scale "Artistic Attitudes". Despite the Subscale presents a few specific questions on arts is intended as a scale for the identification of transversal skills such as the aesthetic sense and critical capacity.

### 3. Conclusions

Identification represents an ongoing dilemma in the field of Giftedness (VanTassel-Baska, (2000). The educational literature shows different identification approaches which are based on different conceptions of Giftedness, from more conservative that associate Giftedness to high IQ scores, to more alternative that define Giftedness as something beyond intellectual skills and intelligence and consider factors like motivation, creativity or even wisdom in the definition of the talented behaviour (Sternberg, 2003).

In Italy, the identification and screening of Giftedness is an emergent area of study. The inclusive Pedagogical model of Italian School leads to a reflection on the way teachers perceive gifted behaviours on their students. Italian school system is open and value diversity and teachers are called to give a response to the learning needs of gifted students “promoting their potential and taking all initiatives useful to the achievement of educational success of students” (Decree of the President of the Republic 275/1999 on school autonomy).

The statistical and qualitative analysis presented in this study has shown that support teachers tend to attribute higher scores than mainstream teachers in the dimension of divergent thinking. It can be assumed that mainstream teachers tend to be more anchored to a *scholastic* view of the children’s potential, and they probably assess children according to their school achievement or their behavior at school, focusing more on their analytic skills rather than their creative or practical skills. On the other hand, teachers that had a training on Special Needs are more keen at assessing children on skills that go beyond the academic areas and that are related to the divergent thinking. Probably, Support teachers have what Longhi and Rondanini (2003), in their contribution, call “*The thin look*” which goes beyond appearances, deep behind the pupil difficulties and recognize its learning potential, its creativity and artistic attitudes.

The first didactic action and intervention for the gifted student are the recognition of its potential. The study highlighted that the same student can be evaluated differently by two teachers of the same classroom in one of the fundamental dimensions of the concept of giftedness: Creativity. Further studies are needed to show whether, and which, group of teachers underestimated or overestimated children skills.

Seen from a developmental perspective, an early identification and ongoing assessment of individuals of uncommon ability are necessary to give students the school support they need and to prevent underachievement and school dropping out of school. The identification process is strictly dependent from the point of view of the observer and his background, the object of the specific evaluation and the theoretical psycho-educational model on which the same identification is based.

An inclusive identification process should focus on the hidden gifted and under-served groups of students and teachers need the training to avoid that children with potential are not recognized or worse are labeled as children with behavioral difficulties. In conclusion, the contribute shows the importance of an evaluation that is multidimensional and that takes into accounts different perspectives and different methods, that brings together what Renzulli (2004) calls “Status information” (test scores, rating scales) and “Action Information” based on dynamic interactions with students that lead to proactive decision making. It emerges the need of professional development in the field of Giftedness for all teachers and in particular for mainstream teachers which can represent in some case the only life chance for the gifted student.

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## PRE-SERVICE TEACHERS PERCEPTIONS OF COOPERATIVE AND INDIVIDUAL-LEARNING

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### Abstract

Cooperative learning is a style of learning strategy that becomes more and more popular as an active pedagogical tool for advancing academic performance (Tsay & Bradym, 2010). Some researchers see it as a good strategy for reducing antisocial behavior of adolescents (Eskay et al., 2012)

Burdett & Hastie (2009), who studied cooperative-learning in higher education, say there are advantages and disadvantages in cooperative-learning. For example, students were worried that the group will overshadow the individuals and that their grades will be lower than those achieved in individual work (Jolliffe, 2007).

The aim of this research was to identify students of teachers training program preferences: Do they prefer to carry out their assignments through cooperative learning or through individual learning? An additional objective was to clarify the reasons offered by students, given that the character of the justifications opens a window onto the students' educational and social world.

The sample was 40 teachers' training students from a teachers-education college. They had carried out individual and cooperative learning in two courses for one semester. At the end of the semester, they answered a questionnaire with five open-ended questions. Their answers were content-analyzed and classified into categories corresponding to their justification. These were validated through a process of inter-rater reliability. The responses in each category were also counted quantitatively.

Findings indicated no differences in the number of pre-service-teachers that prefer group (N=15) vs. individual (N=14) learning (11 didn't express a clear opinion).

The reasons for preferring cooperative learning were: deep and productive thinking, encounter with different content worlds, intellectual contribution and social aspects. At the bottom of the list: clear work rules, a place to express an opinion and better results. The reasons for preferring individual learning were technical issues (time and distance) and personal variables: the desire to be in control, the worry about losing personal freedom, etc. The study indicates that students see cooperative -learning as an opportunity to reach achievements with the group, and also as social opportunities and as ways to make friends.

The findings present the difficulties in cooperative -learning, raised by the students and their suggestions for ways to handle these problems.

To summarize, the perceptions of the learners and their preferences offer evidence of the existence of a need for a range of methods in order to make the learning accessible to the learner in the way most appropriate to him or her.

**Keywords:** *Teachers' training, cooperative-learning, individual-learning.*

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### 1. Introduction

How do students of teachers training program perceive cooperative learning? Different studies indicate that the students enrolled in an academic institution perceive group learning as less significant, because in such situations, some group members will benefit from the work of others and some will invest more work than others will. The latter are concerned about the group grade that will not reflect the varying contributions made by different members of the group.

The present research focuses on cooperative learning and examines how students of teachers training program prefer to execute their assignments—through cooperative or individual learning, and the reasons for these preferences.

The research participants were students of teachers training program, that had participated in cooperative learning during one semester in two courses dealing with integrating different evaluation methods in the teaching of different knowledge areas. The students learned about evaluation instruments, were assessed using these tools and experienced building assignments both through individual and cooperative learning.

## 2. Methods

The **research method** was mainly qualitative, with a touch of a quantitative method. According to Shakedi (2003), qualitative-interpretive research allows subjectivity, a game quality and creative freedom to be expressed during the analysis process. Formally outlining defined methods as a type of educational research in which the researcher is involved creates a mix or an aggregate of techniques, methods, approaches, perceptions and language of qualitative and quantitative research in one study (Onwuegbuzie & Johnson, 2006). A mixed-method research is based on the assumption that each way of collecting knowledge expresses a significant and legitimate view of the issue under examination, and therefore, combining the ways to attain knowledge allows us to learn better and more fully (Antonovsky, 2013).

For the purposes of the study, the preferences of students of teachers training program were examined—40 students, all in basic studies of education, who had carried out individual and group learning for one semester in two courses dealing with combining different evaluation methods in teaching different knowledge areas. The students learned about assessment tools, were evaluated using these tools and experienced building assignments individually and through cooperative learning. It is important to note that the responses of the students may also be based on previous personal experience in other frameworks.

At the end of the semester, students received a questionnaire with five open questions. The students answered these questions and provided reasons and explanations in freestyle. Their answers were content-analyzed and classified into categories corresponding to their justification. These were validated by two researchers through a process of inter-rater reliability. The responses in each category were counted quantitatively, but were also sampled linguistically through selected samples and explained using the collected data, in order to provide a rich and varied basis and examples of different arguments. As is known, the researcher's explanation is a central component in qualitative research. The researcher sifts through the data, compares them, learns from them, and reflects his impressions from and feelings about them. The researcher is free to insert himself into the analysis and he even constitutes a research tool on his own (Alpret, 2011; Shakedi, 2003).

## 3. Findings

In the first stage, students were asked about their preferences. Their answers indicate that there is no difference in the number of students that prefer cooperative learning vs. individual learning. Of the 40 questionnaires, 15 students preferred cooperative learning 14 preferred individual learning and 11 did not express a specific preference for one or the other method.

Figure 1 presents the distribution of reasons among those preferring cooperative learning. The 15 students gave 28 reasons for why they prefer cooperative learning. At the top of the list were deep and productive thinking, the encounter with different content worlds, intellectual contribution and a social aspect. Only at the bottom of the list did clear work rules, a place to express an opinion and better results appear. Table 1 presents several examples taken from the responses of those preferring cooperative learning.

Figure 1. Distribution of the reasons for preferring group learning, by category (percentages).

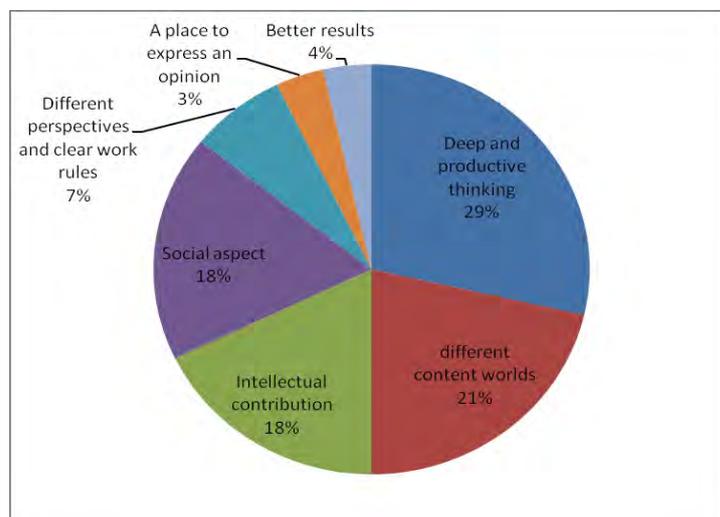


Table 1. Examples of reasons given by students who prefer cooperative learning.

| Aspects of the cooperative learning         | Examples from the students' responses  |
|---|--|
| Deep and productive thinking                | Group work creates deep thinking...in this type of work there are opportunities to develop because you come into contact with different people from different places and with different viewpoints.    |
| Intellectual contribution                   | One experiences unique dynamics in the group and in the learning, when the group members see the group work as an intellectual and professional springboard.   |
| Social aspect                               | From a social aspect, I created additional relations, to which I'm not certain I would otherwise have been exposed. I created social ties...   |
| A place to express an opinion               | Working in a group produced extra benefits for me, I could express my opinion, participate more ...something that was not understood was explained in the group while relating to the individual.      |
| Different perspectives and clear work rules | ...creativity from different perspectives and interest that lead to a type of process of thought synthesis...three people create together a great deal more than one person could possibly do.         |
| Better results                              | My ideas and ability were enhanced working in a team where every person comes from a different knowledge area and brings with him his own ideas and in the end, an extraordinary creation is produced. |

Figure 2 presents the reasons for preferring individual learning. 14 respondents gave 23 reasons for preferring individual learning. The reasons were grouped into the following categories: first, a technical issue—the issue of time and distance. The remaining categories represent personal variables: the desire to be in control, the worry about losing personal freedom of expression, the fear about being exploited and the penchant for working alone. Table 2 presents several examples taken from the responses of those preferring individual learning.

Figure 2. Distribution of the reasons for preferring individual learning, by category (percentages).

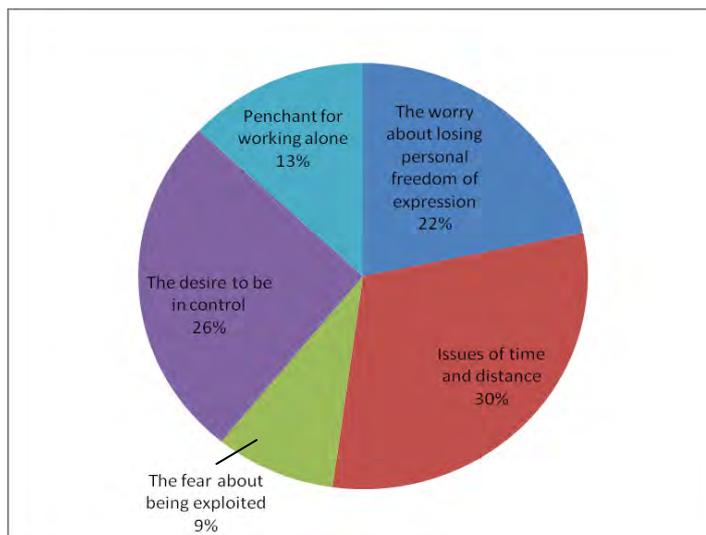


Table 2. Examples of reasons given by students who prefer individual learning.

| Aspects of the individual learning                    | Examples from the students' responses  |
|---|--|
| Issues of time and distance                           | Group work has a lot of problems such as coordinating time, distance, sharing opinions, you're not always lucky enough to have flexible people in the group, I prefer individual learning where I can work alone without being bothered. |
| The desire to be in control                           | I am uncomfortable when the pace of progress and the quality of the product depend on others. I think that it's right that I'm responsible for my grade.   |
| The worry about losing personal freedom of expression | I love to work alone and implement my ideas and not those of other people. I do it all when it is convenient for me and not for the group. I do not like to feel that I do less or more than the rest.                                   |
| The fear about being exploited                        | I am a person who hates to work in groups or with people, at all. It always ends up that one side works harder and the other side gets all the credit  |
| Penchant for working alone                            | In a group I am ill at ease, it is difficult for me...I am mostly quiet and just listen...when I am alone, I do it all.  |

11 respondents did not express a clear opinion, but only 8 of these gave reasons. The reasons reflect logical thinking about the issue, which recognizes the importance of cooperative learning but does not negate individual learning. The respondents, practically all of them, see a combination of the two styles as the most efficient method, as seen in Table 3.

Table 3. Examples of students' statements in favor of both methods.

| Aspects of the cooperative learning | Examples from the students' responses  |
|-------------------------------------|--|
| Overcoming personal worries         | I personally prefer individual work, yet I have no argument regarding the contribution of group work: brainstorming, different opinion, ideas that I hadn't thought of before. All this contributes and enriches.  |
| Concurrent combination              | The combination and the balance between them is the right thing, in my opinion. I believe that the combination of individual assignments and cooperative assignments is very successful.   |
| Situation-dependent combination     | It is easy and important to ponder one's thoughts alone...in other cases, group thinking is productive and enriching.  |
| Seeing both ways as positive        | The natural tendency is to work alone...prevents dependence, control of the task is in one's own hands, and in terms of time, one does not have to consider another. However, cooperative learning contributes...teaches one to allow room for another's opinions and to give up when needed...to know to let go in terms of control...a window to different thinking. |

The group of students in teachers' training program are students with academic characteristics, and therefore, it was possible to check how they perceive the difficulties in cooperative learning, and how they propose to cope with them.

Most problems presented focus on content issues related to a task and technical issues related to distance and time. The students proposed a number of ways to handle these problems. They suggested that to overcome the problem of content related to the task, the group should consult together, get help through the Internet, study using explanatory pages (the rubric, objective sheet) and consult with the lecturer. In order to deal with technical problems related to location and time, the students suggested coordinating through email/phone, focuses work during the study hours at the college, setting up a whatsapp group/Google drive or meet in the municipal library.

#### 4. Discussion

The findings are closer to the findings reported in Burdett & Hastie's (2009) study. This study found that the most positive component stems from the ability to reach achievements with the group: collaboration on ideas, enhancement of the products, joint responsibility and a common objective, and that the students saw that group learning offered social opportunities and ways to make friends.

To summarize, the perceptions of the learners and their preferences offer evidence of the existence of a need for a range of methods in order to make the learning accessible to the learner in the way most appropriate to him or her. The aim is, of course, to enable the learning to succeed and assist the student in realizing his or her abilities optimally and in line with his or her talents and abilities (Gardner, 1993; 1983).

It is important to emphasize that the research tool described here is a questionnaire that all the students filled, but not only for the purposes of this study. The questionnaire was an integral part of the learning process. It focused on meta-cognitive, reflective and social processes, accompanied the teaching-learning process, and examined real, authentic situations having significance to the learners. This way of presenting the questionnaire was found to be advantageous in collecting authentic data during the learning process and without any need to use a questionnaire that may be perceived as artificial by the participating students.

The students' experience as evaluators of methods of individual learning and joint learning during their training in the college may influence their perception of the roles of evaluation processes and the role of the evaluator when they enter the educational system as teachers. The curriculum format that we created during the course may serve, for students, as an example of educational evaluation, which is an inseparable part of the role of the teacher and educator. Therefore, we found that it is very important for their evaluation experience during training while also giving the teacher education students an opportunity to experience the modeling method using good and varied ways of evaluation that reflect the learner's state reliably and verifiably.

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## EYES WIDE OPEN: EXPLORING FACULTY PERCEPTIONS ABOUT STUDENT PROGRESSION AND RETENTION IN HIGHER EDUCATION

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### Abstract

Coping with the demands of higher education (HE) has become such a major issue in academia, that some universities have set generic modules for all disciplines to help their students acquire knowledge and skills that are necessary for the transition into this challenging context. Alike several other developments and changes in academia, this developed interest in the students' coping skills has triggered debates across governmental, public and educational frames (Knox, 2005). At the same time, the number of students entering HE increases dramatically, influencing the academic culture critically by triggering more scientific research and practices in the area (Taylor & Bedford, 2004). Despite the several measures taken to ensure smooth transition, still many educators do not recognise how much they contribute to the students progression (Regan, Dollard & Banks, 2014). The aim of the paper is to provide a better understanding of the differences between teachers, staff and students about students progression, retention and drop-out rates (PRD).

**Keywords:** *Higher education, student progression, retention.*

### 1. Introduction and background of study

There is now a developing focus on the National Student Survey<sup>1</sup> in UK, which places the student experience into the central axis of HE. Since there are so many collaborative partnerships being developed, perceptions of staff regarding their contribution to the student experience becomes very critical, as the 'institutional culture' is more remote than it used to be in the past. However, the way staff experience and understand their impact on students' adjustment is not yet a research area that has produced adequate outcomes. In this paper we focus on the way academics perceive the impact they exercise upon student progression and retention and the associated issues as they stem from the relevant literature and our study. Although there is not a sufficient way of measuring accuracy of perceptions, an effort to identify similarities and differences among staff members of certain levels of an educational institution is highly worthy (Regan, Dollard & Banks, 2014). An example of how influential staff perceptions could be, lies within the findings of the study commenced by the above authors. In their study, one of the main researchers figured that a lot of effort was put by their institution to deal with students issues not related to their studies, because the latter thought of their departments as centralised and not in a position to understand how their attitudes to students problems affected their students' experience. Such findings were replicate also by other studies, which among others also highlighted the importance of how academic staff perceive their contribution.

Within the scope of our paper, the most significant part of the whole picture is that students' progression and associated issues in HE is being developed into a great debate across the world (Knox, 2005). Helping students achieve a satisfactory level of progression throughout their studies is becoming a priority for educational institutions. Not being able to progress satisfactorily can lead to students dropping out, which in turn may have a major financial and personal cost for the students and their families, as well as on the society and its economy due to the skills and the knowledge that are lost (Crossling, Heagney & Thomas, 2009). The development of this debate has generated a new area of research with a clear focus on the impact of academics on students is accurately perceived by staff as major as it is for students progression and retention and whether there is a clear consensus out of this comparison. Within this contextual change, educators are confronting a new challenge: to identify the most appropriate ways to meet the expectations about quality in teaching, learning and assessment as well as in the relationships

<sup>1</sup><http://www.thestudentsurvey.com/>

created with the staff, with which high school graduates enter HE. This transition from High School to University level may be affected by many factors such as the cultural background of the student, the preconceptions they hold entering HE, their expectations, their social class, their age, as well as factors that are not related to the students themselves but they are rather within the control of staff, such as adjustment of teaching style according to the students variability, institutional policies, student-staff interactions etc (Crossling, Headgney & Thomas, 2009). This diversity makes the role of the educator more challenging and the educational process richer, than it would be otherwise.

There are several ways to explain the increasing interest in students' progression issues: As the number of the students who enter increases, so does the diversity of their origin do. This diversity leads to different kinds of attributions given regarding success rates or failures, as well as in various factors being identified as critical in affecting students' progression. Some interesting examples that have been given by the relevant research are lack of motivation, an uncertain start, not being well-prepared for entering a university, lack of competencies, choice of the wrong programme, the type of the teaching provided and adequate resources (Taylor & Bedford, 2009). Other specialists have focused on fully sociopsychological factors, pointing to the 'need to belong' and the 'belongingness hypothesis' which if unmet in education, can decrease students' motivation (Hagenauer & Volet, 2014).

Exploring perceptions from the students' perspectives does not point exactly to the same factors: poor quality of the student experience, lack of abilities, not a positive social environment, financial issues, lack of stress management skills, relationship problems, self-efficacy, quality of teaching, lack of counselling services, satisfactory interaction with staff, lack of goal commitment (Yorke, 1999; Weston, 1998; in Taylor & Bedford, 2009). There is a lot of effort invested in making these factors as specific as possible, to ensure that a adequate care is taken to make the transition of the high school into the university life smoother. Still there are studies (e.g. Krause, Hartley, James, & McInnis, 2005) indicating that the majority of students experience a 'reality shock' as soon as they enter university life. In most cases, such findings stem from research taking place either in the US or in Australia, with inadequate references about the complete picture of the problem in Europe, where passing from a high school cultural mentality to a British educational institution may double the reality shock described above.

Within the International Faculty of the University of Sheffield we focus on these specific challenges and the mechanisms we can use to address them. We have integrated several activities throughout our different departments, to ensure identification of students expectations, in a way that will allow us to use Learning, Teaching and Assessment activities that would contribute more efficiently to students adjustment and progress. We analyse a sample of fifteen participant interviews: current students, students who dropped out, Heads of Departments, Vice Principals and teaching staff. We used a grounded theory approach to indicate the main themes and concepts related to progression and retention issues. We place emphasis on similarities and differences among perceptions concerning student progression and retention, held at the different levels of our academic community. Inferences drawn on our data indicates relevant aspects of staff attributions that can be the foundation for an ongoing professional development: it provides a basis to acquire a more accurate understanding of how expectations need to be identified early and accurately in the initial stages of entering HE and how meeting such expectations is considerably – among other factors – a matter also of creating substantial relationships with the students.

We explore the kind of perceptions that our staff members and students hold and how they are distributed among the different levels that have been set as significant by the relevant research (teaching, learning, assessment and psychological factors). Particular emphasis is placed on the measures taken by the educators and the educational organization and whether these are perceived as facilitating students adjustment and coping with the demands of HE. We also elaborate on the locus of control that both teachers and students use, when they explain PRD rates.

## 2. Method

The aim of our study was to explore perceptions of teaching and management staff, as well as perceptions of students regarding significant factors that can facilitate student progression and retention. Our purpose when designing the study was to collect data from faculty staff, holding positions of different perspectives (management staff with less teaching activity but with a more holistic view of what determines students perceptions, teaching staff who inevitably have a more direct relationship with students, but with possibly less global view of strategies and policies at inter-departmental level). To prevent identification of participants, we present our results in a way in which the focus is on importance and the meaning of the findings, and not on their origin. We used two versions of semi-structured interviews - one for the teaching and management staff, and one for the students. The structured part of the interviews was designed to elicit information about perceptions of influential factors at all possible levels recognised within an institution: teaching, learning and assessment strategies,

internationalisation/culture of the institution, as well as psychological or any other factors not covered by the above. Interviewees were selected from the first respondents to a prompt for participation made either in formal or informal meetings with staff and students. The sound files were transcribed and analysed on the basis of the core themes and categories identified through 10 open ended questions for the staff and 11 open ended questions for the students. Site triangulation was obtained by collecting data from senior management members at Faculty level, senior management level staff from departmental level as well as, teaching staff and students across all different departments. Table 1 displays the different levels of factors explored through the open ended questions in both staff and student interview versions.

Table 1. Themes explored through the interview questions.

|  |   |
|--|---|
| <i>Teaching</i>                                      | <ul style="list-style-type: none"> <li>• Strategies enhancing students motivation and adjustment</li> <li>• The structure of programme in relation to how it affects acquisition of knowledge and skills</li> <li>• Features of the class atmosphere shaped through teaching</li> </ul> |
| <i>Learning</i>                                      | <ul style="list-style-type: none"> <li>• Strategies/practices enhancing learning that are student-centred</li> </ul>  |
| <i>Assessment</i>                                    | <ul style="list-style-type: none"> <li>• Description of assessment practices and justification of how they are seen to facilitate students performance</li> </ul>   |
| <i>Internationalisation/<br/>Culture</i>             | <ul style="list-style-type: none"> <li>• Identification of factors that are seen as attracting students</li> <li>• General factors in the college facilitating students development</li> </ul>  |
| <i>Other factors</i>                                 | <ul style="list-style-type: none"> <li>• Challenges, coping strategies, possible causes of drop-outs</li> </ul>   |
| <i>Psychological factors<br/>(for students only)</i> | <ul style="list-style-type: none"> <li>• Stress generating perceptions, coping skills, expectations, optimism for the future</li> </ul>   |

### 3. Outcomes and Discussion

Responses were transcribed and using a line by line and a constant comparison process manually, similar concepts were categorised and placed into themes and sub-themes. Core and sub-themes identified are shown in table 2. A theme was identified as a general topic appearing repeatedly across and within interviews. Themes not confirmed through repetition among different participants, are not included in this table. All the concepts derived from the interview questions, which included a prompt for exploring perceptions.

Table 2. Core and sub-themes of factors enabling students progress derived from interviews.

|  | <i>Core Category Themes</i>                  | Sub-themes                                  |   |  |   |
|--|--|---|---|--|---|
|  | <i>Teaching,<br/>Learning<br/>Assessment</i> | <i>Support systems</i>                      | Induction   | Tutorials  | Open door policy  |
| <i>Enhancement of skills</i>                                 |  | Simulation of real work environment         | Exposure to real clients  | Exercising transferable skills   | Mock interviews   |
| <i>Interactive activities</i>                                |  | Participation in competitions               | Rewarding students for their strengths and eliminating their weaknesses | Guiding students to exploit the services offered   |   |
| <i>Innovation and variation in teaching &amp; assessment</i> |  | Gamification                                | Employability seminars  | Feedback through video or sound  | Real life projects  |
| <i>Relationships</i>   |  | <i>Personal relationships</i>               | Caring for students well-being, empathizing with students               | Being close and friendly, but setting also clear boundaries of roles (one of the challenges) | Balance between respect and intimacy, contacts outside the faculty (social interaction) |
|  | <i>Respect</i>                               | Knowledge of different cultural mentalities | Responsive to challenges of retention                                   |  |   |

Perceptions were mostly concentrated around the themes displayed in the table above, and were in most cases explained as they follow:

#### *Support services*

Both students and staff perceive the support provided by the Faculty either formally or informally as crucial in deepening students' motivation and in helping them develop and maintain their coping skills for the demands of their study. Induction was mentioned almost by every participant as a process during which the chances of experiencing the 'reality shock' mentioned in a previous section is minimised to a significant extent.

#### *Enhancement of skills*

All participants placed considerable emphasis on the importance of teaching and learning methods that are skills based, instead of knowledge based. A common perception is that such methods bring the student much more closer to the real working environment, which is an expectation commonly held by the majority of candidates when they search for a suitable programme of study and institution.

#### *Interactive activities*

Interaction was also acknowledged as a key feature in enabling students' progression. Participants placed it among the most important aspects of a programme of study, as it is seen as a way to place the student in a context where they form networks with other students and they also feel that their voice is heard and respected.

#### *Innovation and variation in teaching and assessment*

Using innovative methods in teaching, learning and assessment strategies is perceived as a strong stimulus for keeping students engaged and interested throughout their studies. Feedback provided as sound or video files, mock interviews, playing games with an educational purpose were only some of the examples that were pointed as keeping the students excited during their studies.

#### *Relationships*

Caring for students is perceived by the majority of participants as one of the most important factors affecting students' progress and retention. Some participants pointed to the relationships created between staff and students as one of the strongest aspects of the College but expressed also their concern about how cautiously this should be handled, so that boundaries are not misperceived or broken. Also, it is perceived as one of the greatest challenges in academia: to be able to create real substantial relationships with many students concurrently, respecting the uniqueness of every individual at the same time.

Our study aimed to explore the extent to which staff and students in the International Faculty of the University of Sheffield perceive their own contribution to the students progression significant and identify some of the most common perceptions held about certain teaching, learning and assessment strategies. The findings are based on a small sample of qualitative data that can only be the basis for further research which would target to elicit data from larger samples, ideally from the collaborative partners and comparing the effect that the 'remoteness' may have on perceptions.

## **4. Conclusions**

As our study was exploratory in its basis, it would be worth expanding it by using a mixed design with a wider sample, with a clear focus on the staff or on the students, as well as on their comparison from a quantitative basis too. Due to our geographical position and our collaborative partners, the influences from the collaborative cultures may be more critical than we perceive, and it would be worth comparing perceptions of students and staff originating from different countries. For instance, although not within the scope of the present paper and not addressed in here, a common trend in the Balkan area is for a candidate student to be greatly influenced by their family pressures for choosing a degree that would 'pay' better or would serve the family business needs better than some other degree. Family influences might be critical too for students' progression, as in several cases students choose a programme of study on the basis of what their families suggest resulting in them losing their motivation shortly. It would be worth looking at such examples of variables that can lead a student to the wrong programme of choice, with huge effects on their motivation and well being. Once more factors are identified, we could then have a more accurate picture of what seems to be shaping the nature of students PRD rates.

It is also crucial that there are no academics figured, explaining students PRD as the result of their cognitive abilities, which is an indicator of the sense of controllability among our staff with regards to students progression. As there are no attributions among staff members regarding students' inadequacy when progression is not optimal, it appears that part of the progression challenges are perceived as easy to be controlled by academics and would be worth investigating this possibility further.

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## WHOLE SCHOOL SYSTEMS FOR ENGAGING STUDENTS IN LEARNING AND IMPROVED BEHAVIOUR

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### Abstract

Student problem behaviour remains one of the principal issues of discussion for teachers, pre-service teachers, principals in schools and policy makers in education departments. The concern about the effects of problem behaviour on students' engagement with learning and their academic and social outcomes has resulted in considerable research to determine which approaches should be utilised in schools that will improve the engagement and behaviour of students. This study reports upon the results of interviews with principals and 150 surveys of principals and teachers working within a Local Management Group (LMG) model for managing student problem behaviour within an educational jurisdiction in NSW, Australia. The functioning and implementation of the LMG were analysed in the light of literature on best practice approaches for managing student problem behaviours. The study aimed to fill a gap in the literature on schools working together to improve both academic and social outcomes for students with problem behaviours, and improved outcomes for all students. The results of this study concluded that the LMG model develops opportunities for schools to establish common links and practices in both behaviour and learning to ensure that students' needs are met throughout their schooling. The LMG model supports schools working together and supports teachers' professional learning through effective leadership practices and consideration of the needs of students and teachers within the school community.

**Keywords:** *Behaviour, engagement, whole-school, systems, management.*

---

### 1. Introduction

Problem behaviours of students are a concern for teachers from Kindergarten through to Year 12. Research investigating school-age students with problem behaviour typically revealed that problem behaviour was associated with learning and social difficulties and impacted on access to school education and school completion rates (Bailey & Baines, 2012; Conway, 2014). Dropping out of school can result in having reduced employment prospects (Bowlby & McMullen, 2005), increased likelihood of incarceration in prison systems, more mental and physical health problems, and less protective factors that impact their resilience to future adversity (Beltman, Mansfield, & Price, 2011). Because of the demonstrated links between students' lack of engagement and problem behaviours, there has been a greater emphasis by education departments on improving learning and engagement in classrooms in order to prevent or decrease problem behaviour.

A number of specific frameworks and programs to assist in creating a more proactive environment conducive to learning and teaching, have been developed through research and adopted by education departments such as Response to Intervention (AIR, 2015) and in Australia, Positive Behaviour for Learning (PBL) (HCC, 2008). Essentially these approaches encourage schools to develop an agreed set of processes for addressing problems in learning and behavior. Both approaches aim to engage all students in the classroom. Schools have an important role in improving access to the curriculum by adjusting teacher and school practices to change student behaviour and increase engagement with learning.

Mandates from national education bodies, as well as policies and programs from state and district education offices, encourage schools to look to research on whole school systems. These approaches focus on creating positive school climates that reflect the needs and aspirations of the local community through developing a system based on the behavioural and academic needs of all students in the school. The system approach commonly suggests that firstly all students are considered within a general schoolwide approach where behavioural expectations and procedures are taught explicitly to all students. Procedures may include how to line up before class with practice and reinforcement embedded into regular routines for all students in the school. Secondly, students with emerging behavioural difficulties are allocated more specific resources, extra support in class, and have positive behaviour plans developed that are communicated to staff. Thirdly, students who have more severe problem behaviour or mental health issues

may require input from staff with further expertise, and have specific individual behaviour plans and additional resources that target their specific needs.

In recent years there has been a greater focus on students with behaviour problems with a growing awareness that many of these students have learning difficulties and need support within a classroom to better access learning and reduce problem behaviour. Recent research on behaviour in schools in Australia by Angus, et al., (2009), classified the behaviours of students within the classroom as ‘productive’ or ‘unproductive.’ Problem behaviours that impeded a student’s academic progress were termed unproductive, while behaviours that led to positive academic and engagement outcomes were termed productive. These terms recognise the role of the school in improving access to the curriculum by adjusting teacher and school practices to change student behaviour and increase engagement with learning. The shift in focus from ‘problem behaviour’ to ‘problems with learning’ was also reflected in New South Wales educational policies (NSWDEC, 2014) aimed at developing the ‘well-being’ and ‘engagement’ of the student through personalised and differentiated learning expectations.

Government schools in Australia, England and New Zealand implement similar educational, welfare and discipline policies. The policies accessed are used as the basis for implementing specific student behaviour management practices in the school. Schools are expected to follow the principles developed by both their national education body and their state or district. Advice within policies from the above five countries suggest that behaviour approaches in schools must emerge from current research and focus on improving the educational and learning outcomes of all students. Approaches must also involve the whole school and respond to the specific needs of the community (New Zealand Ministry of Education, 2007; NSWDEC, 2014; Ofsted, 2005). Therefore, these countries and states educational sectors have developed approaches based on a systems approach that focuses on preventing problem behaviour of all students through positive support and programming; consistent rules and procedures; increased adjustment and support for some students; and better professional learning for teachers to increase engagement of all students.

For a system to be effective in a particular school community, it needs to be appropriate to the needs of that community. Therefore, there must be autonomy in school communities to tailor systems to suit the needs of each school. The concept of making local decisions by schools increases the authority to support good teaching and learning practices, and increase commitment by teachers to implement suitable programs with fidelity (Lewis, Barrett, Sugai, & Horner, 2010). For this to be effective there must be an emphasis on whole school approaches and pivotal local decisions that reflect the community in which the school is situated (NSWDEC, 2011). Further, one region in the state of New South Wales (NSW), Australia, introduced another level of support that considered students at primary (Kindergarten to Year Six) and high school (Year Seven to Year Twelve) as a continuum of engagement in learning and behaviour from Kindergarten through to Year 12 within a local area that is responsive to local needs. This level of support is a Local Management Model (LMM) where schools form LMGs, pool funding and resources and support for behaviour and learning. A consistent approach to learning and behaviour from Kindergarten to Year 12 was designed to address the provision of appropriate and targeted support for students through increased collaboration and professional development of teachers and schools based on local priorities.

This study reports upon the results of interviews with 12 principals and surveys from 150 principals and teachers working within a LMG model for managing student problem behaviour within an educational jurisdiction in NSW, Australia. The functioning of the LMG was analysed in light of the literature on best practice approaches for managing student problem behaviours. The study aimed to fill a gap in the literature on schools working together to improve both academic and social outcomes for students with problem behaviours, and improved outcomes for all students through professional learning of teachers.

## 2. Method

The methodology in this study employed a Convergent Parallel design (Creswell, 2014). Both qualitative and quantitative data were used to obtain a deeper understanding of the investigated phenomenon – of a LMG implementing behaviour management programs. The methodology was a mixed method design and was characterised by a ‘nested approach’ that gave priority to the qualitative component (the interviews) while the quantitative component (the survey) was embedded or “nested” (Biddix, n.d). A purposive sampling technique was employed as the LMG approach was considered a ‘special or ‘unique’ case as a major focus of the investigation (Teddlie & Yu, 2008). In addition, QSRNVivo10 was utilised as the tool for searching patterns of coding and patterns of text, and as a tool in the detailed analysis of large data extracts. This study also employed a collective case study design where the LMG was the unit of analysis. This collective case study included multiple cases (six LMGs) which were described and compared to provide insight into the structure and functioning of an LMG (Creswell, 2014). Twelve principals (six high school, six primary school) from six LMGs were digitally recorded during a semi-structured interview about their perceptions of involvement in their LMG for managing

student behaviour. In addition, a survey of their school staff was employed that focused on features in each of four systems (schoolwide, non-classroom, classroom and individual) survey for student behaviour support. School teaching staff were asked to determine the current status of each feature and the priority for improving that feature.

### 3. Results

The results of teacher surveys in LMGs within schoolwide, non-classroom, classroom and individual systems were as follows. Eighty five percent (85%) of high school participants and 89% of primary school participants had selected that schoolwide systems were currently in place. Seventy eight percent (78%) of high school participants in comparison to 81% of primary participants had selected that non-classroom systems were in place. There were more significant changes in classroom systems where 44% of high school participants selected that classroom systems were in place as opposed to 54% of primary school participants. The larger point of difference was in the priorities for improving classroom systems with 81% of high school participants compared to 69% selecting either a high or medium improvement priority.

In individual systems, similar trends occurred with high school participants being more concerned about this system than primary school participants. Individual systems were the most concerning for high school participants as only 35% selected it was in place. Although primary school participants were slightly higher at 45% for the current status being in place, it still represented more than half the participants selecting either partial or not in place. Similarly, 81% of high school participants had high or medium improvement priorities, as did 70% of primary school participants.

In contrast, principal comments largely expressed concern for students with chronic behaviour and suggested that these students needed to be retained in their local school. Principals remarked that some teachers employed inadequate teaching strategies that exacerbated the problem behaviour, and sometimes responded to these students with inappropriate behavioural strategies. Principals believed that improved teaching and learning activities would produce more favourable outcomes for both students and teachers. Principals hoped to achieve this through continued professional learning and links to specialist staff with a focus on Kindergarten through to Year 12 as a way to ensure consistency in behaviour and learning. Key to this approach was forming a community of schools from primary school to high school settings. All principals within the LMG structure met regularly and developed and facilitated professional learning opportunities for the classroom teachers between the high school and their feeder primary schools. Teachers shared expertise, developed transition programs between the schools; and focused on a common approach to behaviour and learning.

Principals believed that a way to reduce behaviour problems was by purposefully emphasising strategies to enhance student engagement rather than implementing specific interventions targeting problem behaviours. However, teachers wanted specific interventions from specialists, and removal of students with challenging behavior by principals and head teachers. Therefore, principals believed that the teacher was responsible for creating an environment conducive to engaging learners and reducing problem behaviour. However, principals also acknowledged that teachers needed to be supported in this endeavor by professional learning programs and opportunities to apply new skills and knowledge to their classroom practice.

### 4. Discussion

A model for systems improvement requires building the capacity of teachers to demonstrate improved classroom practices. This can be achieved through all involved with the school believing that learning is a valued outcome. The role of teachers involved igniting a student's interest in learning; providing a school environment where students respect themselves and others; recognising and supporting individual diversity; and by building a school community. Principals in this study believed that they had a major role to play in supporting change in schools. They reinforced that the principals and teachers needed to work together to fully achieve alignment across all behaviour systems supports within their local school community. Principals agreed that effective leadership and the establishment of positive and consistent whole school practices would better ensure that teachers would feel more supported in their classrooms and strive for more positive outcomes for students with problem behaviour.

For a whole school to be effective in providing for the learning and behaviour needs of students, there must be consistent and evidence-based processes and practices. An effective school develops and enacts philosophies, processes and procedures in each of the four systems (schoolwide, non-classroom, classroom and individual) for positive learning and behaviour outcomes (Lewis, et al, 2010). Research indicates that each of the four systems are necessary (Lane, et al., 2015) to provide best practice for working and supporting students with problem behaviour. Schools that incorporate the four systems effectively are more likely to implement effective teaching and instructional strategies from committed and consistent teachers. This, in turn, results in improved student engagement and learning outcomes, and reduced student problem behaviour (Wolfe, et al., 2015).

## 5. Limitations

A limitation of the study was that the data contained perceptions of a small number of teachers which may or may not be the reality of the whole school staff in each school or of the LMGs. There were 150 surveys collected from across 12 schools. However, even with a low return rate overall there appeared to be no survey response bias with a range of positive and negative views expressed by participants. There were relatively consistent responses across the schools. Further exploration of a larger cohort of schools involved in whole school approaches across NSW and/or other states is needed to obtain information and compare between schools at similar stages of implementation of whole school approaches. This has the potential to inform schools of improved behaviour approaches in areas such as transition between primary and high school, professional development of teachers, developing leadership qualities and engagement of students with behaviour problems in classrooms. A larger study in Australia and of the value of LMGs would have an impact and add on to the large body of research emerging from other countries about schoolwide approaches, behaviour and learning.

## 6. Recommendations

The LMG model is a system of support for all schools within a designated local area. It usually involves a group of collegiate principals meeting regularly to discuss and allocate funding and personnel between (usually) one high school and its feeder primary schools. Principals make decisions based upon an agreed management structure and implement decisions as a local group of schools. There are five recommendations for a LMG model approach.

Firstly, the principals who are at the core of the LMG need to commit funds and personnel (such as PBL coaches, professional learning monies) to a pool of resources that address the needs of the local group of schools. Rather than evenly distributing any state jurisdiction funding between individual schools, principals need to develop a set of agreed guidelines with the ideal of shared resources and commitment to the continuum of Kindergarten to Year 12 as a LMG priority. If principals agree that PBL (for example) is the preferred framework to use for behaviour and learning, then a commitment to implement it with fidelity and share the resources across all schools in the LMG is fundamental to success.

Secondly, LMG principals need to make a commitment to implement and strengthen the Kindergarten through to Year 12 continuum of expected student behaviour across the schools. This would involve ensuring that each of their schools are committed to a whole school component that considers a common set of behavioural expectations across each of the primary schools and the high school; use of a common language; and, a common set of defined behavioural expectations. This could be ensured through shared teacher professional learning sessions between schools that build explicit behavioural teaching practices designed for implementation back in their own schools. Regular reviews and interschool exchanges between teachers would increase the likelihood that a consistent set of expectations and language were used. Schools should therefore, explore strategies to transform whole school expectations (including positive and negative consequences) into LMG expectations.

Thirdly, there should be continued professional learning for school staff to improving skill levels in instructional academic issues as well as behavioural issues discussed above. This could be achieved through cross school intercollegiate professional learning days and opportunities. Primary and high school teachers can reinforce their areas of expertise and provide professional learning for each other. Establishing a climate of sharing between high school and primary school teachers ensures a commitment to supporting students in the local area and to consider the community as a continuum of learning through all the years at school. Principals would need to share resources and funding to ensure this cross-collegiate professional learning occurs.

Fourthly, it is important that when schools are implementing an agreed framework such as PBL or a community of schools that each component is assessed, introduced and implemented simultaneously. This study found that implementing only one component at a time causes disharmony and stress amongst staff with decreasing commitment to the process of improving and changing school structures. The implementation of simultaneous systems across each of the schools can be supported by targeted LMG funds and personnel from the initial stages to ongoing reviews of the implementation. Establishment of committees of staff that are regularly rotated and include across-school membership will ensure that there are more opportunities to share resources, increase professional learning, increase skills and offer alternative approaches.

Finally, education jurisdictions need to provide a specific framework and best practice for developing an effective LMG model approach, with supported funding and personnel to enact within the LMG with fidelity and accountability. Jurisdictions need to provide a set of guidelines that ensure LMGs work together on projects that highlight the Kindergarten to Year 12 continuum of learning and behaviour. Allocated funds and personnel should be targeted on joint projects between and across schools, rather than evenly allocated to each school. The decisions on the spending of those funds should be by LMG members who would be accountable for their decisions.

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## **DYNAMICS OF PEER TUTORING IN A HIGHER EDUCATION PROGRAM IN TRINIDAD AND TOBAGO**

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### **Abstract**

Peer tutoring has been widely employed at undergraduate level in higher education settings but there is less research into its usefulness in graduate education courses. Extant research indicates benefits to tutees through knowledge-sharing and socialisation. Peer tutoring involves the use of classroom peers in specific ways such as improved academic improvement and support, and are meant to augment instruction from lecturer. This study focuses on selected peer tutoring relationships in a post-graduate Diploma in Education Information Technology/Computer Science course in Action Research in Trinidad and Tobago. A qualitative narrative study took place with eight participants, four of whom were tutors and four were tutees. Data were collected through interviews with tutors and tutees separately to understand the dynamics of the tutoring relationship. Thematic analysis on the transcribed interview data took place through written transcription and coding iterations. The tutoring took place over one semester on a one-to-one basis. Variation in learning outcomes and perceptions of the relationship are elicited. Findings indicate variation on the need for the tutoring, and that two of the relationships did not occur smoothly. Only one tutee was willing to receive help from the tutor as three tutees were reluctant for help and felt that they were managing well on their own. Tutors tried to motivate their tutees through online and face-to-face meetings. Additionally, the tutor and tutee often engaged in power struggles and a worsening of collegial relations. As a result, even though three of the tutees passed the course, they hardly acknowledged the contributions of the tutor. Tutors experienced some benefits of the tutoring such as improved empathy and but felt that time was lost from their own studies. Recommendations are made for improving the peer tutoring process among adult learners to maximise the benefits for both tutors and tutees.

**Keywords:** *Peer tutoring, power relationships, knowledge-sharing, higher education.*

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### **1. Context/Background to the study**

The Diploma in Education program targets in-service teachers with an undergraduate degree in a specific curriculum area. In this study, teachers of Information Technology/ Computer Science, with have at least five (5) years or more teaching service are selected for the course. For most of them this is their first exposure to pedagogy in teaching and as part of the program, teachers are required to do an Action Research course. This two-semester course requires students to plan, design and execute an action research project in their classroom. At the end of the first semester, where students were required to submit a research proposal, we noticed that certain students were unable to complete the task as required. Suggestions for supporting these students included a peer tutoring initiative. In an attempt to assist these teachers and avert failure, it was decided that same-level peer tutoring would be used as an intervention during the second semester. Four at-risk students were selected for participation in the initiative and four tutors were selected as their tutors in a one-one arrangement. What's app chat messages, phone calls and face to face meetings took place as needed between tutor and tutee over the semester. The tutoring culminated in the successful submission of the Action research report at the end of the semester. This study adds to literature about same level peer tutoring in higher education programmes.

#### **1.1. What is peer tutoring?**

Utley and Mortweet (1997) defined peer tutoring as “a class of practice and strategies, that employ peers as one on one teachers to provide individualized instruction, practice, repetition, and clarification of concepts” (as cited in Bowman-Perrot et al., 2013, p. 39). According to Bowman-Perrot et al. (2013), in order for peer tutoring to be successful the following components must be present, “frequent opportunities to respond, increased time on task, and regular and immediate feedback” (p. 39). Leung (2015, p. 558) also outlined numerous reviews by researchers to highlight the positive impact that peer tutoring has on academic achievement.

When peer tutoring occurs on the same level or (same age) it is usually recognized that the tutor has acquired more expertise or skill in the area under study and the tutee is the novice and require some support in the area. When peer tutoring occurs cross levels or (cross age), in this case across different year groups, the tutors have been through the program and they have an understanding of what works and what doesn't. Status can play a major role in the peer tutoring relationship. According to Rosen, Powell and Scubot (1997, p. 247), the role of the tutor connotes or carries with it more status and presents itself to be the more desirable role than that of the tutee. It is also pertinent to note that the tutee may have been placed in a position where they are under "external pressure" to accept the assistance that they need but have not necessarily asked for or want to accept (Rosen, Powell & Scubot, 1997, p. 244). The tutee may also see the tutor's status as a "relevant resource" as undeserved (Rosen, Powell & Scubot, 1997, p. 244).

### **1.2. Benefits of peer tutoring**

Peer tutors can provide a range of benefits such as support of the tutees, tutors developing their roles as counselors and advisors, and as instructors because of their experience or expertise in the task (Colvin, 2007, p. 167). The social benefits of peer tutoring include improved personal locus of control, self-esteem and social skills (Gordon, 2005). In addition to this there are some convincing reasons for peer tutoring such as it can help the struggling student disclose to their peer that they do not understand and allow the tutor to explain in a more understandable way (Gordon, 2005, p. 3). This sharing can bring both the tutor and tutee closer together. The tutor becomes the motivator of the tutee while they themselves can become more competent in the subject matter.

### **1.3. Challenges to peer tutoring**

Despite the many benefits of peer tutoring many challenges also exist. Collaboration in unequal partnerships can lead to power struggles. Negotiation of power takes place and the tutoring can be successful if "interactional control is usually shared and power is negotiated" (Jones, Garralda, Li, & Lock, 2006, p. 2).

### **1.4. Research questions**

Overarching question: What are tutor and tutee perspectives of same level peer tutoring in an Action Research course within a post graduate inservice Education programme?

1. What are benefits to tutors and tutees in a same level peer tutoring initiative in an Action Research course within a post graduate inservice IT Education programme?

2. What are challenges to tutors and tutees in a same level peer tutoring initiative in an Action Research course within a post graduate inservice IT Education programme?

## **2. Theoretical framework**

### **2.1. Social learning and situated learning**

Theories of social development that promote social interaction for learning and Lave and Wenger's (1991) situated learning theories are important for examination of how teachers can learn both in and out of school in informal spaces such as in school corridors, lunch rooms and even at home. Vygotsky's (1978) 'zone of proximal development' helps to explain that learning takes place at work in formal and informal settings by novices observing more advanced learners and can apply that to practice almost immediately. The success of learning in such an environment is predicated on trust, that is, trust of the learning space, trust of the knowledge transmitted and trust of the participants themselves (Usoro, Sharratt, Tsui and Shekhar, 2007).

### **2.2. Teachers as adult learners**

Knowles' (1990) work on adult learning has established varying differences between andragogy and pedagogy. Knowles' work has elements of constructivism such as self-direction and problem-centred learning; as well as that of motivation as his concept of adult learning suggests that as learners grow and mature, they become more and more capable of being self-directed and wise due to their experiences and past knowledge. Blondy (2007) concludes that Knowles' work is applicable to online learning environments and that his assumptions can help educators to create a more learner-centred approach to online education. Kamalodeen (2014) also asserts that adult informal teacher learning occurs online and face-to-face with a preference for face-to-face.

## **3. Method**

### **3.1. Qualitative inquiry**

Qualitative inquiry allows for open interpretation of the matter being studied. Thematic inquiry looks for themes across groups that are the result of shared experiences (Butler-Kisber, 2010). Researcher

reflexivity is paramount to building data trustworthiness. Instead of generalizability, ‘particularizability’ is preferred (Butler-Kisber, 2010, p.13).

### 3.2. Participants

Four pairs of tutors were interviewed. These participants were the only peer tutor relationships in the course and pairs were constituted by the course lecturers. Students had an option not to participate. A same level peer tutoring relationship was established as all participants were taking the Action Research course and had the same assignments and deadlines to meet. Tutees were selected by the lecturers based on poor performance in the previous semester. Tutors were purposively sampled to tutor. There was no choice in pairing. All participants were female and from different schools in Trinidad. Ages ranged from 25-35. Variables such as age, school, and gender were not considered.

### 3.3. Interviews

Semi structured interviews were conducted over a period of two weeks at the end of the course. 8 interviews were done, one for each participant and conducted by both researchers as far as possible. Each interview lasted between 30-45 minutes and were conducted online and recorded digitally. The date and time was agreed to before. Digital recordings and transcribed interviews were kept in folders and duplicated for security. These files are kept safe. Interviews took place over a two week period.

### 3.4. Analysis

Digital recordings were transcribed by hand by a third party. Some member checking took place to reduce errors. Thematic analysis took place on the transcribed notes and main themes coded. Each tutee is labelled t1-4, each tutor is labelled T1-4. A constant comparative analysis methods was used to elicit codes and themes for tutor and tutee perspectives.

### 3.5. Ethics

Constructed realities allow for multiple realities and ways of knowing. This study valued the voices of both the tutor and tutee and allowed them to describe freely their experiences of peer tutoring. One to one semi-structured interviews allowed these voices to be captured. As lecturers in the course, we facilitated open exchange of views with both or one lecturer as interviewer, to ensure that the interviewee was comfortable. This allowed for more authentic portrayals of participants and increased ethical practice. We were reflexive in issues related to power and position as lecturers and interviewers and to increase participation, we conducted interviews after final examinations were conducted and grades were obtained. Of the 8 participants, 7 passed the course, while one did not. We tried to reduce subjectivity and increase data trustworthiness by keeping all questions standard for all interviewees and making safe digital recordings of the interview. Participants were asked to verify the transcription by sharing the transcribed file of the participant.

## 4. Findings and discussion

The study aimed to answer two key research questions related to benefits and challenges of same level peer tutoring in higher education. The data acquired indicate that there were several benefits to both tutors and tutees but also many challenges to the peer-tutoring arrangement, which are presented in tables.

*Table 1. Benefits of peer tutoring to tutors and tutees.*

| Benefits                               | Sample quote from tutor (T)  | Sample quote from tutee (t)   |
|--|--|---|
| <b>Tutors developed as instructors</b> | T3: "... I was able to see someone else's work. That kinda helped, you know looking at things from a different point of view. It help, and it kinda forced me to realize that my way, yes, I like things a certain way, and I would do things a certain way, it kinda force me to see that my way is not the only way. | t2: "...what I learnt from most...when we had to share, we sat down for hours face actually and we brainstormed, we discussed the objectives..."<br>t3: "... she taught me how to use how to do the research..."  |
| <b>Tutors developed as counsellors</b> | T2: "...it was me trying to motivate as well as peer tutor..."<br>T3: "...I have a lot more patience..."   | t3: "...very kind...very gentle...very very encouraging."<br>t1: "... she always praise me...she always say, go girl, you doing good... she was like a mentor to me."<br>t2: "...the little times we collaborated she encouraged that... she encouraged talking out. ... stress the importance of confidentiality..." |

Table 1. Benefits of peer tutoring to tutors and tutees (cont.).

|   |  |  |
|---|--|--|
| <b>Tutors and tutees gain in subject matter knowledge</b> | <p>T4: "...helping her was actually a form of reinforcement,...I would learn somethings and I would apply it..."</p> <p>T3: "...then I see somebody put it a different way and I was like, oh yeah, I thought that actually could work..."</p> | <p>t2: "...you have to make the effort to go through everything and to be on top of it... I think she would have done that because she was really good."</p> |
|---|--|--|

Findings indicate three major benefits to the peer tutoring where tutors developed themselves as instructors, counselors and increased knowledge of the content. Three of the tutees indicated that at the beginning of the intervention their tutors helped them and that their tutors were understanding and motivated them. The tutors expressed that they were able to see things from a different point of view and that their views were not the only view. Peer tutoring strategy is one in which the tutor having a little more experience or expertise than the tutee takes on the responsibility of instructor in a limited capacity (Boud, 2014). According to Boud (2014), in this case "reciprocal peer learning is considered incidental" as the student tutor is considered to be a more advanced or have greater expertise in the subject matter. Although knowledge sharing occurs between the tutor and tutee, on the part of the tutor it is considered to be incidental. The tutor provides emotional support to the tutee along with the expertise on the subject matter itself (Boud, 2014). Challenges to the process are now presented in table 2.

Table 2. Challenges in the peer tutoring process.

| Challenge                               | Sample quote from tutor (T)  | Sample quote from tutee (t)   |
|---|--|---|
| <b>Lack of Communication from tutee</b> | <p>T1: "... I would say lack of communication, in terms of I would just I would just say make mention ok xyz needs to be done and it need to be done at this point in time, but would have normally get it from Michele or from you or you all would inform me, 'hear what', that still was not submitted."</p>  | <p>t1: "...We didn't get to communicate the way I want."</p> <p>t4: "We didn't really have time to converse..."</p> <p>t2: "I will encourage that ...face to face then some online... you know a blend because you know sometimes you are better with pen and paper, you put everything down you explain ideas, the facial expression which you cannot to online..."</p>  |
| <b>Tutoring was burdensome</b>          | <p>T4: "It was me trying to motivate as well as peer tutor and this was draining my energy."</p> <p>T3: "...having my own work to do, am, that was very time consuming then having to split my time and my focus with somebody else's, that was a big challenge..."</p>  | <p>t2 " I knew everything from my Masters Programme I knew what to do, I was just taking my time."</p> <p>t3 "... I acknowledge it makes yeah, I don't like asking for help, but I don't have a problem acknowledging when I need help."</p> <p>t3: "...alright am I think that was the most that (tutor) had helped me with after that she she did call up and follow up with me, but yeah I and I felt that I was a burdening her."</p>                 |
| <b>Personality clashes</b>              | <p>T1: "Ok well I realize that I'm organized and I realize that other people not and am I also realize that am a lot of people tend to negate deadline date, like for me it will bother me until I get it done, and some people have the knack to just ignore it."</p> <p>T4: "...you kinda have to be very tactical in terms of how you dealt with them..."</p> | <p>t4: "My personality type does not accept help easily, does not ask for help easily."</p> <p>t4: "You have to know whether or not the person will generally help the next; so you will have to examine personalities closely."</p>  |
| <b>Suspicion about motives of tutor</b> |  | <p>t3: "and she made a statement that we working hard so them should work hard too. And I was like Oh my God! She probably felt the same way about me because she was doing all the hard work like everybody else and then maybe we needed to pull our own weight too. So I wasn't sure that she was helping me or she was just trying to help you guys because you offered you know..."</p> <p>"I wasn't too sure of her motive in the whole thing."</p> |

One of the biggest factors affecting the peer tutoring arrangement/relationship was the communication issues and lack of feedback from tutees. All tutors indicated that the communication with the tutees were difficult as communication was conducted mainly via WhatsApp Messaging or phone

calls. Only one tutor-tutee pair had face to face communication. Despite the fact that all tutees recognized that they needed help and the assigned tutors wanted to help, one of the tutee's stated that they knew what to do while the other two indicated that they didn't have problems acknowledging that they needed help but do not like asking for help and only one accepted the help willingly. Another challenge highlighted by the tutors was linked to the tutees' personalities. The constant need for motivate because of the lack of self confidence of the tutees in themselves was sometimes tedious and as one tutor indicated energy draining. Tutors also stated that the tutees were procrastinators, disorganized and underestimated the amount of work that was required. While they themselves were organized and anxious about deadlines. Additionally one of the tutees expressed that there were many contributing factors that affected her performance which ranged from her intense workload, working environment and what she prioritized as more important at that point in time. Tutees on the other hand expressed the view that they were unclear of the motives behind the help that they were receiving. This is closely linked to status and power dynamics of the peer tutoring. Tutees did not seem to gain benefits of higher self-esteem and social skills as suggested by Gordon (2005). Three of the tutors felt that the tutees were embarrassed while two of the tutees expressed that they were embarrassed to ask for help and that they felt they were a burden to the tutors as well as the lecturers.

## 5. Conclusion and Recommendations

The same level peer tutoring initiative in a higher education course was largely successful as it resulted in passes in the course in Action Research in 3 out of 4 tutees. However it was unsuccessful due to the power struggles within the relationships and the ensuing breakdown of relationships. Personality clashes also resulted in communication breakdown and resentment by tutees about the tutoring process.

It is recommended that tutees should have a choice of tutor and whether or not they wish to participate in the tutoring process. Tutors also seemed to require more support from course lecturers in guidance of the process. Alternate ways of offering support for struggling students in higher education need to be explored. Matching of personalities may be helpful in order to assist with communication issues.

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# THE NEGLECTED TWIN: NUMERACY PATHWAYS TO CRITICAL THINKING

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## Abstract

This writing challenges the dominant discourse around critical literacy as the major proponent of critical thinking. Instead, it argues that critical numeracy skills best support the development of the cognitive capacities of critical thinking as an essential 21st century competency. A widely -accepted definition of critical thinking is examined in order to identify the critical cognitive components of this mental activity and the ways in which they are operationalized to solve problems and to develop critical perspectives in the context of classroom learning and beyond. An analysis of the thinking skills required to engage successfully in mathematical learning is also undertaken, followed by an extrapolation of the interpolated components of adaptive reasoning, which is the vital intellectual activity required for creative problem solving. A framework is then developed to illustrate that the logic and rational thinking that are characteristics of adaptive reasoning, together with the mathematical understanding of generalizing, are the foundational capacities upon which critical thinking is predicated.

**Keywords:** *Numeracy, Critical Thinking, Adaptive Reasoning.*

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## 1. Introduction

The current Neo Liberal paradigm of economic rationalism as applied to educational contexts has resulted in the development of what may be seen as *Education's Terrible Twins* (Cope & Kalantzis, 2009): numeracy and literacy. Not only do these discipline areas dominate the curriculum, define student achievement, and minimize the opportunities for students to engage in other areas of learning, they define what is considered to be important in developing global citizenship skills the 21<sup>st</sup> century (Parsons & Bynners, undated). Historically, and indeed currently, major stress is placed on students' competencies in literacy, most particularly in critical literacy, while numeracy has frequently been regarded as the domain of those who have a mathematically orientated brain (Whitin & Whitin, 2011). While this notion of a 'mathematical brain'(Devlin, 2010; Kilpatrick, Swafford, & Findell, 2001) has been repudiated in many academic environments for some decades, the true impact of the unchallenged discourse which privileges the development of language literacy skills as the most prestigious and valuable factor in the development of critical thinking skills is yet to be realised (Steen, 1990a, 1997, 1990b).

## 2. Critical Thinking

Language literacy was the overarching and dominant focus of 20<sup>th</sup> century educational endeavour in most educational contexts that are identified as schooling. It was an avenue of empowerment and impacted on the social and economic prospects of a considerable number of people worldwide as evidenced in Freirean work in critical pedagogy (Freire, 1970). Despite the merits of language literacy and its salient position in modern society, the 21<sup>st</sup> century presents not only a different environment for the world's populations for a variety of reasons, but also an increasing requirement for all individuals to develop the cognitive capacities of critical thinking (Almeida & Franco, 2011; Lipman, 1987; R Paul, 2005) in order to thrive and contribute to their own and other's wellbeing in an environment which is unprecedented in terms of rapid change, technological advances and global mobilization (Spring, 2008). These cognitive capacities are defined by authors in this field in various ways. What is commonly agreed, irrespective of differences perspective is summed up by Scriven and Paul in 1987:

Critical thinking is the intellectually disciplined process of actively and skilfully conceptualizing, applying, analysing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. (R. Paul & Elder, 2008)

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This increasing requirement of the information age is vital simply because of the sheer amount of information and the speed with which it may be accessed and brought in to the personal world of individuals internationally, and the ways in which it is presented.

### 3. The Importance of Numeracy

Long passages of text that relayed information via print media have been rapidly replaced by multi-media texts which engage the receiver with image, video and mathematical representations which required different literacies than those developed in the 20<sup>th</sup> century (Cope & Kalantzis, 2009; Healy, 2008). They rely heavily on the individual's capacities to interpret data, to engage with increasingly large groups of complex statistical information and to make meaning from these communications in increasingly narrow windows of time. Individuals who are innumerate in the 21<sup>st</sup> century are not only the new illiterate, but are also precariously placed in societies where community supports and facilities are privatised and where profitability and contribution to the increasing economic capital of the few is the bench mark of an individual's worth as a citizen and member of society (Geiger, Goos, & Forgasz, 2015; Lake, 2002; Skovsmose, 1994, 2012; Stoessiger, 2002). The principal way in which individuals may address the inequalities produced, not only by the politicization of education, is to engage meaningfully in the learning domain previously believed to be the province of the mathematically gifted and to apply mathematical skills to realities in their own contexts and everyday environments (Cohen Kadosh, Dowker, Heine, Kaufmann, & Kucian, 2013; Lingard, 2011; Macmillan, 2009).

The reality is that mathematical knowledge and skills are basic everyday activity (Brandt & Chernoff, 2015). Mathematical knowledge and skills are the foundation upon which all areas of discipline are operationalised (Ferme, 2014; Sellars, in press). Performing as numeracy competencies, they provide optimum opportunities for the development of the cognitive capacities identified as critical numeracy (Ahana, 2014; Law, 2005; R Paul, 2005). Effective teaching and learning that incorporates the interpolation of the five mathematical competencies (Kilpatrick et al., 2001), with specific emphasis on the development on the cognitive capacities of adaptive reasoning, would provide a strong basis for the growth of the critical numeracy capacities that effective participation in the global community demands (Watson, 2008a, 2008b; Whitin & Whitin, 2011). The cognitive capacities of adaptive reasoning, whilst remaining an interpolated part of the other five mathematical actions; particularly strategic competence; is also a set of cognitive capacities in itself. It incorporates not only the flexible thinking associated with strategic mathematical competence but also engages students in various types of logical thinking, reflection, explanation and justification (Sullivan, 2011). A critical aspect of adaptive reasoning is that the justification which the authors refer is not explicitly related to scientific proof or mathematical correctness. It appears to be intrinsically related to the process of logical thinking, explaining, and justifying through engaging in the cognitive processes analysing and evaluating.

The development of these mathematical capacities, in the context of making meaning in terms of mathematical patterns and relationships (Kilpatrick et al., 2001) (abductive and inductive reasoning), combine, with time and experience to allow students to develop the important abstractions that comprise mathematical generalizing and to follow logical steps to determine these generalizations (Kilpatrick et al., 2001; Siemon et al., 2013) (inductive reasoning). A developing awareness of the mathematical principles that are embedded in all the discipline areas across the curriculum as numeracy affords teachers and their students multiple opportunities in diverse contexts to build the skills and strategies that they need to develop critical thinking skills that can applied frequently in various contexts that involve the use of these cognitive skills across several literacies, including literacy and numeracy.

#### 4. Conclusion

The 21<sup>st</sup> century globalised context, the demands of global citizenship and the pervasive nature of mathematical concepts, skills and understandings in the everyday lives of all individuals necessitate a focus on the development of numeracy competencies for all students. The authentic development of numeracy competencies promotes a flexibility of thinking which includes ways in which to analyse issues and situations logically and from differing starting points. These cognitive capacities contribute significantly to the development of critical thinking skills to which they are not only closely linked conceptually but also contextually. As a result, a relational, intellectual framework that links these cognitive capacities may be developed.

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## ANALYZING WESTERN CHOIR EDUCATION COURSES IN MUSIC DEPARTMENTS OF FINE ARTS HIGH SCHOOL

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### Abstract

This research is a descriptive study using qualitative research methods that are used in the courses of Western Music Chorus Education courses in Fine Arts High School Music department.

This research was conducted as an analysis of the interviews conducted with the teachers who are practicing the teaching program in order to determine the teaching methods used in the implementation of the Western Music Chorus Education Curriculum, which was put into force by the Ministry of National Education Ministry of Education Board of Education, number 156 and 11.09.2009.

A standardized open-ended interview technique was used to obtain information on the subject, thus enabling a realistic and holistic examination of the environment or events under study. A semi-structured interview form consisting of 1 open-ended interview question was used as data collection tool in the research. This form was answered by 10 chorus teachers who are working on the Fine Arts High School. All the obtained data were interpreted by analyzing the content and the results of the research showed that the teaching methods used in the western music chorus education course were focused on attention, motivation, goal informing and pre-condition learning with reminder activities, technology-supported teaching method and cooperative learning (team) study with the method of teaching.

**Keywords:** *Western Music Choir Education, High School of Fine Arts, Teaching Methods.*

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### 1. Introduction

Human beings are in communication with their surroundings since their existence. He talks about the skills that people need most in terms of sustaining their social relations. "Talk; voice and music" (Kaplan, 2005: 126).

The songs that the music language and the speech language meet can be vocalized by individuals as well as by "Chorus" which is a very important means of conveying the culture of individuals. (Alpuğan, 2010: 6).

While expressing emotions and thoughts, people converse speech language with music art and collectively express the basis of chorus music.

"Chorus" in the art of music is a form of collective singing that is widely expressed in voice and verbal. Koreans are crowded groups of people. Chorus music is an artistic transfer where chorus trainings are made and musical expression power is given to common musical talents by people in different structures (Gökçe, 2008: 19).

Through the course of Western music chorus education in fine arts high schools, it is aimed to help the formation and development of the way of saying appropriate to our language in our country and to perform the chorus music works in choral consciousness.

### 2. Purpose of the research

The aim of this research is to review and re-interpret the teaching methods and techniques used in the Western Music Choral Education course in Fine Arts High Schools in Turkey.

#### 2.1. The Importance of Research

This research; Determination of the teaching methods used by the teachers in the Western Music Choir Education course is important in terms of evaluating the teaching methods in terms of modern approaches in teaching.

### 3. Methods

This research is a qualitative research model and a descriptive study. Yıldırım and Şimşek (2006) point out that the qualitative research is aimed to examine in depth from the point of view of the people and to reveal related social structures and processes. Descriptive methods are intended to reveal the state of interest and the problem that is to be investigated. The most basic feature of these methods is to work as if the current situation is within their own conditions. Descriptive research requires data gathering to test hypotheses about the current state of the studied subject or to find answers to questions.

#### 3.1. Collection of data

In order to get information about the subject, source scanning and "semi-structured interview form" (Yıldırım & Şimşek, 2006) technique was used. In order to determine the teaching methods used, interview forms consisting of a single question were presented to the 10 teachers who entered the Western Music Chorus Education course in Fine Arts High School during 2015-2016 Education - Academic Year and the answers were analyzed by 4 music field experts. The main aim in content analysis is to reach the concepts and relations that can explain the data (Taşancıl and Aslan 2001).

### 4. Findings

Table 1.

| Teacher      | Entrance Activities | Demonstration | Technology Assisted Instruction | Cooperative Instruction |
|--------------|---------------------|---------------|---------------------------------|-------------------------|
| 1            | X                   | X             | x                               |                         |
| 2            | X                   | X             |                                 |                         |
| 3            | X                   | X             |                                 |                         |
| 4            | X                   | X             |                                 |                         |
| 5            | X                   | X             |                                 |                         |
| 6            | X                   | X             |                                 |                         |
| 7            | X                   | X             |                                 | x                       |
| 8            | X                   | X             |                                 |                         |
| 9            | X                   | X             |                                 |                         |
| 10           | X                   | x             |                                 |                         |
| <b>TOTAL</b> | <b>10</b>           | <b>10</b>     | <b>1</b>                        | <b>1</b>                |

According to research findings:

All 10 teachers started classes with entrance activities; Breathing exercises, relaxation exercises, telling about the work, 10 teachers using the demonstration method, 1 teacher using the technology assisted teaching method and 1 teacher using the cooperative teaching method.

### 5. Discussion, results and recommendations

The course is a period of time which is defined as 40 minutes in our country, where the teaching-learning process occurs. Good planning of this time frame is important for the right selection of the methods to be used, for achieving the objectives, for reaching the targets and for increasing the quality of the education. The most important element of learning-teaching process is teaching activities. Teaching activities; Is the department in which the aims and behaviors determined for the course or topic are determined and how the methods, tools and materials to be used are determined and planned. This section can be reviewed in three steps:

- Entrance Activities
- Development Activities
- Result Activities ( Sünbül,2000).

Introductory activities, which consist of attention, motivation, informing the goal and reminding of the pre-requisite learning, are very important for the students to be ready mentally and emotionally at the beginning of the course. In chorus education courses, the introduction activities should be in the form of body exercises, breathing exercises, sound exercises, resonating exercises, giving information about the work. All the teachers participating in this study were found to use entrance activities at the beginning of the lesson.

The development activities, the materials to be used together with the teaching strategies, methods and techniques to be used in the lessons are presented; Teacher and student activities.

According to the research data; It has been determined that the teaching methods for the lesson or subject are identified and applied and all the teachers use the demonstration method when the teaching

methods emerged in this section are examined. The demonstration part is a teacher and the making process is a student centered method. This method is also effective in acquiring psycho-motor skills as it is based on learning by doing and living more. (Aykaç, 2005). The demonstration method creates an effective learning environment because visual and auditory elements are used together, especially when students are given specific skills. This method, which we used a lot in chorus education courses, is quite effective because it appeals to the eyes and ears at the same moment. It is also a useful way of improving the interpretation of the work to be done, revealing the standards of the work to be done, drawing attention of the learners.

According to the research data; It has been found out that a teacher has also made a group (team) work with the students through a cooperative learning method. Cooperative learning is an approach by students to learn a subject by working together for a common purpose to solve a problem by creating small groups (Christison, 1990 translated by Demirel 2012). A number of studies have investigated whether cooperative learning techniques are effective in increasing learning. Sevinç and Yiğit (2017) reported that teamwork based learning method is more effective in enhancing academic achievement in choral education than traditional teaching method in their report titled "The Importance of Team Based Learning in Choir Training". Based on this result, it can be suggested that collaborative learning method should be used more frequently in choir education courses.

According to the research data; It has been found that a teacher also uses a technology-assisted teaching method. From the beginning of the twenty-first century, instructional technology is at the forefront of basic learning platforms to meet student needs. The use of technology in the class allows the use of media from different sources, where information is presented in a variety of ways to meet different learning needs. In many scientific researches, it has been shown that using appropriate technology increases the learning enthusiasm, allows students to think and learn new knowledge by processing student knowledge (Borich, 2014). In this regard, it is suggested that the technology assisted teaching method is used more frequently in chorus education courses.

When the basic material of a choral education course is thought to be human voice, the step of determining the teaching methods to be used is a very sensitive and important issue. Choir education courses should begin with physical, mental, emotional and intuitional preparations. In a choral education course, it is necessary to make a teaching in a frame supported by the effective communication of the teachers and the students, activation of the students, group work and use of technology.

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## STUDENTS' PERCEPTIONS OF COOPERATIVE-LEARNING

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### Abstract

Cooperative learning is a style of learning strategy that becomes more and more popular as an active pedagogical tool for advancing academic performance (Tsay & Bradym, 2010). Some researchers see it as a good strategy for reducing antisocial behavior of adolescents (Eskay et al., 2012)

Burdett & Hastie (2009), who studied cooperative-learning in higher education, say there are advantages and disadvantages in cooperative-learning. For example, students were worried that the group will overshadow the individuals and that their grades will be lower than those achieved in individual work (Jolliffe, 2007).

The aim of this research was to identify students of teachers training program preferences: Do they prefer to carry out their assignments through cooperative learning or through individual learning? An additional objective was to clarify the reasons offered by students, given that the character of the justifications opens a window onto the students' educational and social world.

The sample was 40 teachers' training students from a teachers-education college. They had carried out individual and cooperative learning in two courses for one semester. At the end of the semester, they answered a questionnaire with five open-ended questions. Their answers were content-analyzed and classified into categories corresponding to their justification. These were validated through a process of inter-rater reliability. The responses in each category were also counted quantitatively.

Findings indicated no differences in the number of pre-service-teachers that prefer group (N=15) vs. individual (N=14) learning (11 didn't express a clear opinion).

The reasons for preferring cooperative learning were: deep and productive thinking, encounter with different content worlds, intellectual contribution and social aspects. At the bottom of the list: clear work rules, a place to express an opinion and better results.

The reasons for preferring individual learning were technical issues (time and distance) and personal variables: the desire to be in control, the worry about losing personal freedom, etc.

The study indicates that students see cooperative -learning as an opportunity to reach achievements with the group, and also as social opportunities and as ways to make friends.

The findings present the difficulties in cooperative -learning, raised by the students and their suggestions for ways to handle these problems.

To summarize, the perceptions of the learners and their preferences offer evidence of the existence of a need for a range of methods in order to make the learning accessible to the learner in the way most appropriate to him or her.

**Keywords:** *Teachers' training, cooperative-learning, individual-learning.*

### 1. Introduction

How do students of teachers training program perceive cooperative learning? Different studies indicate that the students enrolled in an academic institution perceive group learning as less significant, because in such situations, some group members will benefit from the work of others and some will invest more work than others will. The latter are concerned about the group grade that will not reflect the varying contributions made by different members of the group.

The present research focuses on cooperative learning and examines how students of teachers training program prefer to execute their assignments—through cooperative or individual learning, and the reasons for these preferences.

The research participants were students of teachers training program, that had participated in cooperative learning during one semester in two courses dealing with integrating different evaluation methods in the teaching of different knowledge areas. The students learned about evaluation instruments, were assessed using these tools and experienced building assignments both through individual and cooperative learning.

## 2. Methods

The **research method** was mainly qualitative, with a touch of a quantitative method. According to Shakedi (2003), qualitative-interpretive research allows subjectivity, a game quality and creative freedom to be expressed during the analysis process. Formally outlining defined methods as a type of educational research in which the researcher is involved creates a mix or an aggregate of techniques, methods, approaches, perceptions and language of qualitative and quantitative research in one study (Onwuegbuzie & Johnson, 2006). A mixed-method research is based on the assumption that each way of collecting knowledge expresses a significant and legitimate view of the issue under examination, and therefore, combining the ways to attain knowledge allows us to learn better and more fully (Antonovsky, 2013).

For the purposes of the study, the preferences of students of teachers training program were examined—40 students, all in basic studies of education, who had carried out individual and group learning for one semester in two courses dealing with combining different evaluation methods in teaching different knowledge areas. The students learned about assessment tools, were evaluated using these tools and experienced building assignments individually and through cooperative learning. It is important to note that the responses of the students may also be based on previous personal experience in other frameworks.

At the end of the semester, students received a questionnaire with five open questions. The students answered these questions and provided reasons and explanations in freestyle. Their answers were content-analyzed and classified into categories corresponding to their justification. These were validated by two researchers through a process of inter-rater reliability. The responses in each category were counted quantitatively, but were also sampled linguistically through selected samples and explained using the collected data, in order to provide a rich and varied basis and examples of different arguments. As is known, the researcher's explanation is a central component in qualitative research. The researcher sifts through the data, compares them, learns from them, and reflects his impressions from and feelings about them. The researcher is free to insert himself into the analysis and he even constitutes a research tool on his own (Alpret, 2011; Shakedi, 2003).

## 3. Findings

In the first stage, students were asked about their preferences. Their answers indicate that there is no difference in the number of students that prefer cooperative learning vs. individual learning. Of the 40 questionnaires, 15 students preferred cooperative learning 14 preferred individual learning and 11 did not express a specific preference for one or the other method.

Figure 1 presents the distribution of reasons among those preferring cooperative learning. The 15 students gave 28 reasons for why they prefer cooperative learning. At the top of the list were deep and productive thinking, the encounter with different content worlds, intellectual contribution and a social aspect. Only at the bottom of the list did clear work rules, a place to express an opinion and better results appear. Table 1 presents several examples taken from the responses of those preferring cooperative learning.

Figure 1. Distribution of the reasons for preferring group learning, by category (percentages).

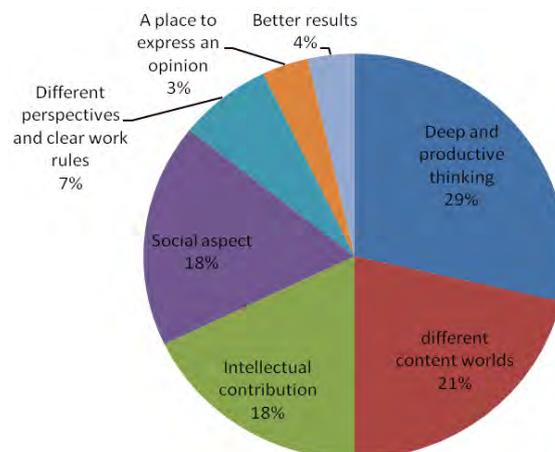


Table 1. Examples of reasons given by students who prefer cooperative learning.

| Aspects of the cooperative learning         | Examples from the students' responses  |
|---|--|
| Deep and productive thinking                | Group work creates deep thinking...in this type of work there are opportunities to develop because you come into contact with different people from different places and with different viewpoints.    |
| Intellectual contribution                   | One experiences unique dynamics in the group and in the learning, when the group members see the group work as an intellectual and professional springboard.   |
| Social aspect                               | From a social aspect, I created additional relations, to which I'm not certain I would otherwise have been exposed. I created social ties...   |
| A place to express an opinion               | Working in a group produced extra benefits for me, I could express my opinion, participate more ...something that was not understood was explained in the group while relating to the individual.      |
| Different perspectives and clear work rules | ...creativity from different perspectives and interest that lead to a type of process of thought synthesis...three people create together a great deal more than one person could possibly do.         |
| Better results                              | My ideas and ability were enhanced working in a team where every person comes from a different knowledge area and brings with him his own ideas and in the end, an extraordinary creation is produced. |

Figure 2 presents the reasons for preferring individual learning. 14 respondents gave 23 reasons for preferring individual learning. The reasons were grouped into the following categories: first, a technical issue—the issue of time and distance. The remaining categories represent personal variables: the desire to be in control, the worry about losing personal freedom of expression, the fear about being exploited and the penchant for working alone. Table 2 presents several examples taken from the responses of those preferring individual learning.

Figure 2. Distribution of the reasons for preferring individual learning, by category (percentages).

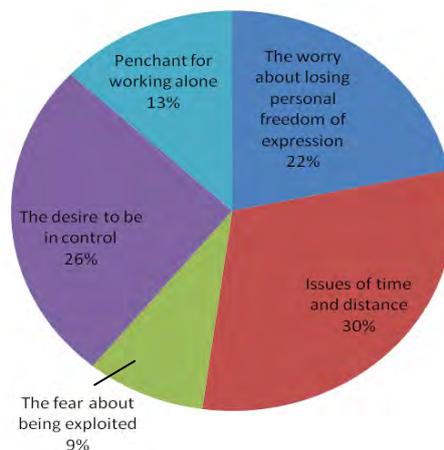


Table 2. Examples of reasons given by students who prefer individual learning.

| Aspects of the individual learning                    | Examples from the students' responses  |
|---|--|
| Issues of time and distance                           | Group work has a lot of problems such as coordinating time, distance, sharing opinions, you're not always lucky enough to have flexible people in the group, I prefer individual learning where I can work alone without being bothered. |
| The desire to be in control                           | I am uncomfortable when the pace of progress and the quality of the product depend on others. I think that it's right that I'm responsible for my grade.   |
| The worry about losing personal freedom of expression | I love to work alone and implement my ideas and not those of other people. I do it all when it is convenient for me and not for the group. I do not like to feel that I do less or more than the rest.                                   |
| The fear about being exploited                        | I am a person who hates to work in groups or with people, at all. It always ends up that one side works harder and the other side gets all the credit  |
| Penchant for working alone                            | In a group I am ill at ease, it is difficult for me...I am mostly quiet and just listen...when I am alone, I do it all.  |

11 respondents did not express a clear opinion, but only 8 of these gave reasons. The reasons reflect logical thinking about the issue, which recognizes the importance of cooperative learning but does not negate individual learning. The respondents, practically all of them, see a combination of the two styles as the most efficient method, as seen in Table 3.

Table 3. Examples of students' statements in favor of both methods.

| Aspects of the cooperative learning | Examples from the students' responses  |
|-------------------------------------|--|
| Overcoming personal worries         | I personally prefer individual work, yet I have no argument regarding the contribution of group work: brainstorming, different opinion, ideas that I hadn't thought of before. All this contributes and enriches.  |
| Concurrent combination              | The combination and the balance between them is the right thing, in my opinion. I believe that the combination of individual assignments and cooperative assignments is very successful.   |
| Situation-dependent combination     | It is easy and important to ponder one's thoughts alone...in other cases, group thinking is productive and enriching.  |
| Seeing both ways as positive        | The natural tendency is to work alone...prevents dependence, control of the task is in one's own hands, and in terms of time, one does not have to consider another. However, cooperative learning contributes...teaches one to allow room for another's opinions and to give up when needed...to know to let go in terms of control...a window to different thinking. |

The group of students in teachers' training program are students with academic characteristics, and therefore, it was possible to check how they perceive the difficulties in cooperative learning, and how they propose to cope with them.

Most problems presented focus on content issues related to a task and technical issues related to distance and time. The students proposed a number of ways to handle these problems. They suggested that to overcome the problem of content related to the task, the group should consult together, get help through the Internet, study using explanatory pages (the rubric, objective sheet) and consult with the lecturer. In order to deal with technical problems related to location and time, the students suggested coordinating through email/phone, focuses work during the study hours at the college, setting up a whatsapp group/Google drive or meet in the municipal library.

#### 4. Discussion

The findings are closer to the findings reported in Burdett & Hastie's (2009) study. This study found that the most positive component stems from the ability to reach achievements with the group: collaboration on ideas, enhancement of the products, joint responsibility and a common objective, and that the students saw that group learning offered social opportunities and ways to make friends.

To summarize, the perceptions of the learners and their preferences offer evidence of the existence of a need for a range of methods in order to make the learning accessible to the learner in the way most appropriate to him or her. The aim is, of course, to enable the learning to succeed and assist the student in realizing his or her abilities optimally and in line with his or her talents and abilities (Gardner, 1993; 1983).

It is important to emphasize that the research tool described here is a questionnaire that all the students filled, but not only for the purposes of this study. The questionnaire was an integral part of the learning process. It focused on meta-cognitive, reflective and social processes, accompanied the teaching-learning process, and examined real, authentic situations having significance to the learners. This way of presenting the questionnaire was found to be advantageous in collecting authentic data during the learning process and without any need to use a questionnaire that may be perceived as artificial by the participating students.

The students' experience as evaluators of methods of individual learning and joint learning during their training in the college may influence their perception of the roles of evaluation processes and the role of the evaluator when they enter the educational system as teachers. The curriculum format that we created during the course may serve, for students, as an example of educational evaluation, which is an inseparable part of the role of the teacher and educator. Therefore, we found that it is very important for their evaluation experience during training while also giving the teacher education students an opportunity to experience the modeling method using good and varied ways of evaluation that reflect the learner's state reliably and verifiably.

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## **DEAF-BLIND STUDENTS ARE PERCEIVED TO HAVE LOW ABILITIES DUE TO LIMITED LANGUAGE SKILLS**

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### **Abstract**

The nature of this study is to provide information regarding deaf-blind students' poor performance on standardized tests because of poor language skills, causing educators to assume they are low achievers. What strategies should educators use to help them, so they will increase their language skills, thus giving them the tools to succeed academically? How can deaf-blind students be provided opportunities for incidental learning to expand their foundation of language? Measuring deaf-blind students' academic and verbal abilities is difficult because of their poor communication skills. Informal assessments are used to judge deaf-blind students' proficiency, as no standardized assessments exist to measure their cognitive and linguistic abilities. This leaves the psychologist to estimate where the students' ability levels lie. All too often, educators rely far too heavily on formal assessments to help guide their instruction. Reliance on such estimates makes it difficult for teachers to design programs to meet their unique academic needs. This study suggests concrete strategies for increasing deaf-blind students' language skills by incorporating opportunities for incidental learning that will increase the frequency and function of language, thereby giving these students the tools needed for academic success.

**Keywords:** *Incidental learning, deaf-blind, voice-output communication aid (VOCA), funnel questions, intervener.*

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### **1. Introduction**

Deaf-blindness is a dual sensory impairment that affects people's vision and hearing simultaneously. Individuals do not need to be totally without total vision and hearing to be identified as deaf-blind. When children are both deaf and blind, complete information cannot be assessed in a clear and concise manner because the visual and auditory flow of information does not occur (Deafblindness and the Role of the Intervener 2011). Some causes of deaf-blindness range from genetic syndromes, such as Usher's Syndrome and Charge Syndrome as well as complications from pregnancy. Certain illnesses, such as rubella, cytomegalovirus, and toxoplasmosis are also causes of deaf-blindness ("Primary Etiology of Deaf-Blindness-Frequency" 2015) As of 2015, approximately 8,937 deaf-blind children, ages birth-21 are registered in the United States (National Center on Deaf-Blindness, National Child Count 2015).

Adults that form bonds with students who are deaf-blind facilitate the development of language, which evolves over an eight-step process. A study by McInnes and Treffry (as cited by da Costa, M.P.R & Cader-Nascimento, F.A.A.A. [2003]) lists the eight steps of students' language development: (1) resisting interaction (2) tolerating the interaction (3) cooperating passively with the intervener (4) showing pleasure and satisfaction in participating (5) responding to the stimuli (6) leads the intervener through the activity once the initial direction has been given (7) imitates the action of the adult upon request (8) initiating the action independently. It is imperative that educators are aware of these steps and, if possible, have the skills required for interaction with deaf-blind children. Each stage of the students' language development necessitates a concurrent emotional readiness. For example, Stage 1 (resists interaction) shows the children are both fearful of the situation and adult. Stage 2 (tolerating interaction) indicates students beginning to trust the adult. Stage 3 (cooperating with the adult) implies the students are aware of their surroundings. Stage 4 (showing pleasure and satisfaction when participating) indicates students' cognitive awareness and comfort with their surroundings. Stage 5 (responding to stimuli provided by the adult) allows students to recall their interactions with the teacher or intervener. Stage 6 (leading the intervener through an activity once direction has been given) students are confident in both himself and the adult. Stage 7 (when students start to imitate the adult) they are starting to master skills. Stage 8 (students initiate the interaction with the adult) they are confident and showing creativity.

(McInnes & Treffy, 1999). Many times, deaf-blind students only perform well when they are comfortable with their surroundings. After establishing and maintaining a personal relationship with adults, as stated in the eight stages by McInnes and Treffy, the students will be able to demonstrate what they truly comprehend.

## 2. Literature Review

According to “The National Center on Deaf-Blindness” (2002), children learn to communicate through social interactions. Typical infants “talk” with their parent(s) or caregivers using eye contact, turning towards the speaker, and facial expressions. In contrast, children who are deaf, blind, or deaf-blind do not have a typical way to communicate to those around them. Children who are deaf are unable to turn toward the speaker but can make eye contact and manifest facial expressions. When acquiring language, deaf children learn concrete vocabulary (cat, ice, brush) easier than abstract words (perfect, incredible, hooray). Similarly, children who are blind have language development that is inhibited by their lack of sight. Those who are blind do not use eye contact to communicate with others, and often do not make use of facial expressions. They will first learn concrete vocabulary, by touch, using real life objects (cat, ice, brush) to develop language skills. Abstract vocabulary, while it can be easier to develop than their deaf peers, is still difficult for blind youngsters to learn. The need to touch objects to learn vocabulary is necessary for development; however, there are no concrete examples of abstract words (perfect, incredible, hooray). Children with deaf-blindness face even greater obstacles concerning communication because the lack of both hearing and vision, this inhibits the social interactions between the child and caregivers. Simply put, deaf-blind children’s vocabulary development is long and arduous. Like other children who are deaf or blind, children with deaf-blindness learn concrete vocabulary first using real life objects.

Assessing a deaf-blind student’s ability is a complicated process. Currently, standardized assessments are not widely used for students with deaf-blindness because modifying standardized assessments could sacrifice the integrity of the tests. Administering some of these evaluations to measure the ability of deaf-blind students’ is difficult, as the tests are not normed for these students (Belote et al. 2008). There are assessments that professionals have used to measure a children’s ability with deaf-blindness. These tests are rating scales that parents and practitioners who know the child can complete. Standardized tests measure intelligence, language skills, social/emotional developments, and sensory or motor development, just to name a few. Different tests measure different attributes. The teacher, parent, psychologist or blind observers observe the child and record what they see. Observational assessments can be subjective, depending on who is completing the rating scale, because what a child knows is not always what is observed.

To ameliorate these assessments’ shortcomings, experts have devised various tests. These assessments explicitly state they measure deaf-blind students’ abilities in different areas.

- *The School Inventory of Problem Solving Skills (SIPSS)* is an assessment designed to measure cognitive skills related to object use in children who are deaf-blind or have severe and multiple disabilities. It evaluates basic skills with objects, ways for children to gain access to objects, and way for children to use objects. (Chen, Mar, Rowland, Stillman 2016).

- *The Communication Matrix* is an instrument designed to assess expressive communication skills in individuals functioning at the early stages of language development. The Communication Matrix is well suited for children who are deaf-blind because the items are not tied to a particular sensory modality and easily administered regardless of the child’s original pattern of expression. The instrument, designed for use by professionals who directly observe and elicit communicative from the child, gathers information through interviews with parents and teachers (Belote et al. 2008).

- *The Callier-Azusa Scale G* is a criterion-referenced; judgment based developmental scale last updated in 1978. It was designed to provide guidance for classroom teachers when planning goals and objectives and measure progress for children who are deaf-blind or have other severe and multiple disabilities. This test was created to assess the developmental level of children who could not be adequately tested by another assessment tools due to lower levels of development. The evaluation is based on observation of the child in classroom activities. One or more persons who have considerable experience with the child in the classroom setting complete this scale. The Callier-Azusa G contains a myriad of examples under each item that describes how a child who is deaf-blind might demonstrate a particular skill. These examples were drawn from teacher/therapist reports and reflect behaviors observed among children who are deaf-blind.

- *The Callier-Azusa Scale H* is a criterion-referenced, judgment based developmental scale that was designed specifically to assess the communicative abilities of children who are deaf-blind; it was last revised in 1985. The Callier-Azusa Scale H provides a highly detailed evaluation of communicative skills

in representational and symbolic development, receptive communication, intentional communication, and reciprocity. Assessment is based on observation of the child in classroom activities; the evaluation is completed by one or more persons who have considerable experience with the child in a variety of contexts. (Belote et al. 2008)

*Incidental learning* is knowledge gained unintentionally as a result of other activities. It occurs through the observation of the surrounding stimuli then using problem-solving skills to interpret the information to form a conclusion. The loss of vision and hearing makes it problematic for children with deaf-blindness to learn incidentally. Consequently, the absence of these occasions prevents the students from authentic learning opportunities for language acquisition. While it is difficult for deaf-blind students to learn incidentally, it is not impossible. The depth of knowledge obtained might not be as extensive as their peers with vision and hearing, but the information gained is valuable. For incidental learning to occur, students with deaf-blindness must have language to label the experiences to aid comprehension. This requires the adults to expose children with deaf-blindness to numerous opportunities to acquire language to build their linguistic foundation. According to Hagood and Moss (1995) developing communication is a priority for learning. Deaf-blind children rely on others to teach them language of items or experiences around them. Without a core language basis, incidental learning is not beneficial to deaf-blind children.

### 3. Profile

John Smith was adopted as a newborn. His birth mother took narcotics during her pregnancy and John tested positive for cocaine at birth. Born at 24 weeks gestation, he weighed one pound, eight ounces. He failed his infant hearing screening and was diagnosed with retinopathy of prematurity (ROP is a disorder that causes abnormal blood vessel growth in the eyes of premature infants, resulting in retinal damage and sometimes detachment). John does not have vision in his right eye and has blurred distant vision in his left. He has a bilateral moderate to profound sensorineural hearing loss (which occurs when there is damage to the cochlea or auditory nerve. Few surgical options exist to correct a sensorineural hearing loss).

During his pre-school years, John communicated with his family using facial expressions and movements. Once he started school, John was assigned an in-class interpreter because of the residual vision in his left eye. For years, John and his interpreter sat in a class for students with special needs. While in elementary school, John received direct services from a teacher for the deaf and hard of hearing two times a week for 20 minutes at a time. Initially, he resisted the teacher using tactile sign but he eventually tolerated it in small doses. When he moved to the fifth grade, he continued with his direct instruction from a teacher of the deaf for 30 minutes twice a week and tolerated the physicality of the working relationship with his teachers. He would accept hand over hand guidance and sign, but he would not allow the touch for extended amounts of time.

During the sixth grade, John received direct services from a teacher for the deaf and hard of hearing for 60 minutes five days a week. He also was assigned an intervener to work with him one on one all day. An *intervener* is someone trained to work one on one with a deaf-blind individual to help him or her learn concepts, gather information, and establish a relationship so the student can build a life that leads to independence. (Alsop, Killoran, Robinson, Durkel, & Prouty, 2004; McGinnes, 1986; Robinson et al., 2000). In addition, he was also given a voice-output communication aid, which he took to very well. A *voice-output communication aid (VOCA)* is an electronic speech-generating device that augments or replaces speech in individuals with significant speech impairments. His communication program on his VOCA was Proloquo2go on an iPad, which later changed to LAMP, Words for Life. LAMP, Words for Life and Proloquo2Go are communication apps, which gave John the ability to tell others what he was doing during his day. His communication was still limited, but he was communicating nonetheless. When John was eleven, he was taken to a school for the blind to have several assessments administered. The psychologists were unable to get accurate results from his work. They estimated his full scale IQ to be around 40 but did state they could not get an accurate measurement.

When transitioning to seventh grade, John continued working with his intervener and his augmentative speech device. Over the summer, his intervener introduced the entire vocabulary menu from the program, which consists of 84 core words. He was able to master words and phrases before he started seventh grade. With the instruction of his teachers, speech pathologist, and intervener, John used the language he had learned on his voice-output communication aid and began to answer questions independently. Once John had success with language and communication, he began to complete tasks in class. He still did not initiate a lot of social communication, but he was answering basic questions and making simple requests. John finally had the tools to express himself, his wants and needs. His last year of middle school, John continued to grow in both academics and language with the guidance of his

intervener. He worked tirelessly on his voice-output communication aid with his speech pathologist and intervener as well.

John transitioned to high school with little trouble. He still has his intervener, his communication device, and now a new teacher for the deaf and hard of hearing. His teacher quickly noticed that he could master the activities she had planned for him. His assessment scores were not used to guide instruction rather, she used his progress observed in class. He read sight words easily, which prompted his teacher to incorporate the sight words into sentences and longer reading passages. He could answer comprehension questions from both fiction and nonfiction short stories. The daily use of “funnel questions” helped improve his level of language, both receptively and expressively, proficiency increased within a few short months. *Funnel questions* begin with a broad question and then use information from the answer to ask more detailed questions until precise information is obtained.

Table 1. Funnel Question example.

| Teacher                                       | Student  |
|---|--|
| “What did you do this weekend?”               | “Watched T.V.”                                       |
| “What did you watch on T.V.?”                 | “Little House on the Prairie”                        |
| “What happened on the show?”                  | “Laura sold her horse.”                              |
| “Why did Laura sell her horse?”               | “To buy Ma a stove for Christmas.”                   |
| “Wow. How do you think Laura feels about Ma?” | “She loves her.”                                     |
| “How can you tell she loves Ma?”              | “She sold her horse to get money to buy Ma a stove.” |

John went from answering questions using one-word to communicating with complete sentences. His teacher also incorporated games as a way to give him incidental learning opportunities in order to expose him to more conversational language and learning experiences that might not arise in planned lessons. John even started to initiate conversation and joke around with his teachers. When he voluntarily expressed his feelings about his teacher, she knew he was ready for more extensive and arduous programming. His language improved exponentially, which helped him to succeed academically.

#### 4. Conclusion

Developing deaf-blind children’s language is a long, complicated process that requires creativity and flexibility. Their language education is both formal and informal. In a formal sense, educators should specifically design language instruction to ensure deaf-blind students meet the required goals and objectives written for their students. Teaching vocabulary using real life objects and experiences is the most reliable way to ensure they comprehend vocabulary. The constant labeling of items and practices is vital to their language acquisition. The use of funnel questions helps deaf-blind children give detailed answers to assist their expressive language development. The informal language lessons develop through incidental learning experiences. Playing cards, cooking, and gardening are just a few ways students can incidentally learn language. Teachers should be aware that all experiences are opportunities for language learning.

Having John tested, after only knowing the examiners for a few days, was not an ideal situation but the only choice that was available. He needs to trust the people with whom he communicates. John is a perfect example of the eight stages of trust, written by McInnes & Treffey. That feeling of confidence and safety is what John needs to communicate with others. His lack of trust is why the evaluators were not able to assess him accurately. When I asked John about his assessment experience, he told me it was frustrating. I asked him why; he said he did not have the words to give them. His lack of language is why we need to focus heavily on language acquisition in the early years. His test scores are the reasons why his teachers in school were not able to plan programming that was challenging enough. The educators knew he had more ability than what the testing stated, but were unable to plan for his unique needs. His teachers prepared lessons according to the assessments results and what progress he made in school. No one is at fault. Unfortunately, we sometimes miss the mark, and our mistakes can have lasting effects. I have seen John evolve from a student where his goals were to develop language requests up to four words to a student who is: reading and comprehending at a seventh-grade level. John is using complete sentences on his communication device, spelling his thoughts when he cannot find the word on his VOCA. He counts money, can compare prices, and pays for items using the next dollar strategy while shopping out in the community. He has gained so much in the short time since he has found success with language. He is a perfect example that test scores are not the only measure of a child’s ability. It is imperative that we, as educators look beyond scores and data, and see the child.

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## UNDERSTANDING MULTI-GRADE TEACHING WITHIN SOUTH AFRICAN CONTEXT

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### Abstract

Multi-grade teaching arrangement is a common practice across the globe and most often than not, it comes as a contingency strategy in developing countries, instead of it being a choice of such pedagogy. The use of multi-grade teaching as a back-up teaching arrangement was not successful in many African educational ministries because of inadequacies in schools' resources and a lack of specialised curriculum for teachers and schools. Some educational ministries display an effort in integrating multi-grade teaching in the teacher education and in the schooling curriculum.

However, South African approach to teacher training still focuses on mono-grade teaching. Teachers from teachers' training centres are only equipped to provide mono-grade teaching despite the fact that many of them land in multi-grade schools. The purpose of the study was to examine the instructional practices used in multi-grade teaching. The study was underpinned by interpretive epistemology that is embedded in a qualitative research paradigm, and generated its empirical data from unstructured interviews and document study. Two Limpopo primary schools, one community school and one farm school were purposively selected. The findings revealed that both schools were organised as mono-teaching schools, and due to small rolls of learners they were converted to multi-grade teaching arrangements. Teachers use different curriculum for different grades within one classroom. They teach one grade when the other grades are given activities. The teachers are faced with a challenge of curriculum coverage, a lack of training to teach in multi-grade schools and a lack of curricular support. This study recommends collaboration between the Department of Basic Education and Department of Higher Education and Training and teacher training centres to provide in-service training for teachers in multi-grade teaching. A long term-strategy is recommended wherein multi-grade teaching is integrated within teacher education curriculum.

**Keywords:** *Multi-grade teaching, mono-grade teaching, instructional practice, pedagogy, curriculum.*

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### 1. Introduction

Multi-grade teaching arrangement is a common practice across the globe. In developed countries and some developing parts of Asia, multi-grade teaching is the most preferred teaching arrangement than in African communities. An African perspective of multi-grade teaching makes it unwanted teaching arrangement. The African common practice to multi-grade teaching is that it is used as a contingency strategy when resources available cannot accommodate mono-grade teaching.

As a result of United Nations Millennium Goal number 2, on basic education, states started to prioritised education. This resulted with 'No Child Left Behind' campaigns in the United States of America and 'Compulsory basic education in South Africa'. The Constitution of South Africa, Act 108 of 1996, Section 29 put this agenda very clear when it stipulates that everyone has the right to a basic education, including adult basic education; and to further education, which the state, through reasonable measures, must make progressively available and accessible (Constitution of the Republic of South Africa, 1996).

## **2. Interpretive epistemology**

Within the interpretive epistemology, the researcher understood that reality is multiple and relative (Hudson and Ozanne, 1988) and depends on how meaning is constructed by different people (Guba and Lincoln, 1984). The differences in approach to multi-grade teaching are the result of how reality is being interpreted. Furthermore, other systems of meaning (Guba and Lincoln, 1985) are guided by multiple factors ranging from socio-economic factors, level of education and availability of resources.

## **3. Multi-grade teaching versus mono-grade teaching**

Multi-grade teaching and mono-grade teaching differs and to allow teachers acclimatise from mono-grade teaching to multi-grade teaching can be a mammoth of task that requires continuous teachers training, support by curricular specialist and school and adequate school resources. The research shows that teachers in developed countries can be transferred to any teaching arrangement without many difficulties.

However, it was found to a problematic area in Africa, particularly in South Africa, because of lack of competencies on content and pedagogy amongst pre-service and practicing teachers and lack of school resources (Botha and Reddy 2011). Shortage of qualified teachers competent to teach subjects such as Mathematics and to teach foundation phase in Africa Languages (Centre for Development and Enterprise 2014: 6) are some of challenges crippling South African education system. Chaka and Weber (2017) suggest key competencies required for successful transition from mono-grade teaching to multi-grade teaching, namely, curriculum adaptation and planning; learner organisational and teaching strategies and assessment. Despite the challenges encountered in the roll-out of multi-grade teaching, there are multiple competencies that are associated with it. Msimang (2014: 22) outlines learners competencies derived from multi-grade teaching, namely, higher self-concept; strong feeling of belonging; peer tutoring; leadership opportunities; promotion of higher cognition, self-regulated learning and provides for space for individualised teaching.

## **4. Multi-grade teaching as an instructional practice in South Africa**

The Department of Education in South Africa defines multi-grade teaching as the teaching of learners of different grades in the same classroom setting at the same time (Department of Basic Education 2015: 6). Multi-grade teaching is used as a back-up or contingency plan when mono-grade teaching was impossible because of the reduced roll of students or due to shortage of teachers. Most often than not, schools that are established in deep rural or farm school with low student population, adopt multi-grade teaching. Countries that adopted multi-grade as stand-alone teaching strategy have conceptualised multi-grade teaching differently. Haingura (2014: 3) put this perspective crystal clear when he define multi-grade teaching as a mode of teaching where one teacher teaches more than one grade in one classroom at the same time.

Multi-grade teaching practice was not successful and sustainable because the educational ministries in some parts of the globe do not provide specialised curriculum, pedagogy and approach for its success. Some educational ministries indicates a substantial effort by provision of the specialised in-service and pre-service training of teachers for multi-grade teaching, provision of multi-grade teaching curriculum, adequate resources and support. South Africa, like other African states is still lacking behind as far as provision of such multi-grade's necessities are concerned.

## **5. Empirical study**

### **5.1. Methodology**

The study was underpinned by interpretive epistemology that is embedded in a qualitative research paradigm. A case study which involved two Limpopo primary schools, one community school and one farm school were purposively selected. Empirical data was generated from unstructured interviews and document study. Content analysis was used as a primary data analysis technique.

## 5.2. Findings

The findings reveal that both schools were organised as mono-teaching schools, and due to small rolls of learners they were converted to multi-grade teaching arrangements. Teachers use different curriculum for different grades within one classroom. Taole and Mncube (2012) study reveals that in South Africa there is no curriculum differentiation between mono-grade teaching and multi-grade teaching. Teachers teach one grade when the other grades are given activities. Teachers are faced with a challenge of curriculum coverage, a lack of training to teach in multi-grade schools and a lack of curricular support. A lack of strategic teaching and learning resources was found to be a disturbing factor in both schools.

Data reveal that teachers who are expected to offer multi-grade teaching are without knowledge on how to adapt and plan multi-grade curriculum from three Curriculum and assessment Policy Statement (CAPS) for Grade 1, 2 and 3. It was further revealed that teachers do not have required competencies on learner organisational and teaching strategies. Teachers were found giving each grade different assessment tasks. When asked on how they succeed on integrating assessment for three phases, their response was they are expected to give each group different assessment, and compile different mark sheets as per grade. Teaching and assessment integration was found missing in both schools. The findings on lack of competencies on adapting and planning the multi-grade curriculum from the mono-grade curriculum; lack of competencies on learner organisational and teaching strategies; and lack of assessment integration, are line with what was observed by Chaka and Weber (2017).

## 6. Conclusion and recommendations

This study recommends collaboration between the Department of Basic Education and Department of Higher Education and Training and teacher training centres to provide in-service training for teachers in multi-grade teaching. A long term-strategy is recommended wherein multi-grade teaching is integrated within teacher education curriculum.

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## **PARTICIPATION IN EXTRACURRICULAR ACTIVITY: DISTINCTIONS CAUSED BY CULTURAL AND SOCIAL STATUS OF FAMILIES**

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### **Abstract**

We present results of research on involvement of children in extracurricular activity conducted by NRU HSE together with Levada Center as part of «Monitoring of Education Markets and Organizations». The survey covered over 2,000 parents of school students involved in extracurricular activity provided by various institutions. We analyze correlations between parameters of student involvement in extracurricular activity (the rate and continuity/discontinuity of services consumption; the choice of types of extracurricular activity programs and institutions; the place of extracurricular activity in the structure of spare time and vacations) and family characteristics (place of living, financial status, cultural and educational background). We discuss how manifestation of inequality in access of Russian children extracurricular activity is affected by some specific features of organization and regulations in this field. We suggest solutions to allow for the revealed differences in the national education policies.

**Keywords:** *Extracurricular activity, educational inequality, cultural capital, educational policy.*

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### **1. Introduction**

The existing researches contain high evidential estimates of importance of extracurricular activity for development and socialization of children [Peterson, Fowler, Dunham, 2013, Gliffin, 1999; Lareau, Weininger, 2008].

However with a growth of research activity in the field of distinction in children's involvement in extracurricular activity, mechanisms of reproduction of inequality in this sphere are insufficiently studied comparing to inequality in general and vocational education.

Growth of attention to tasks of development of extracurricular activity from the international organizations confirms the importance of a research of this matter for provision of effective political solutions.

For modern Russia the matter under consideration has special relevance. In the Soviet Union there was a developed system of free extracurricular activity at school (clubs, sections) and out of school (Palaces of Pioneers, music and sports schools, Stations of Young Technicians, etc.) providing coverage of considerable amount of children.

During the Post-Soviet period there was a reduction of network of the out-of-school organizations, deterioration in their personnel and material resources. Social and economic differentiation in society has at the same time significantly amplified. Schools and the out-of-school organizations began to offer paid services which were not available for low-income families.

Free of charge basis and general availability of extracurricular activity of children, unlike the general, isn't the state obligation in Russia.

The last 5 years (since 2012) in Russia sharp strengthening of attention of the state to extracurricular activity of children is noted. The key task formulated in political documents (Presidential decree, etc.) consists in increase of coverage of extracurricular activity programs, involvement of bigger amount of kids. At the same time the position of the state concerning ensuring equality of chances of receiving supplement education is not explicitly articulated.

In this report the scale of distinctions in an involvement of children from different groups of families and their connection with the level of well-being of a family (the property status), the place of accommodation (a geographical factor), education level of parents is discussed.

### **2. Design**

In the analysis of distinctions in scales and the nature of participation of children in extracurricular activity we were guided by the concept of the family capital of J. Coleman according to

which differentiation of educational opportunities of children is caused by distinctions in family resources (first of all in education of parents and level of their income) [Coleman, 1988].

Besides, for interpretation of behavior of groups of families in the market of services of extracurricular activity we use the rational choice theory according to which people behave trying to maximize the benefit in the market of services on the basis of the optimum volume of information. Within this theory features of the concrete market (a variety of the offer, level of information asymmetry) and ability of consumers of services to use the available information, significantly depends on education level [Becker, 1976; Coleman, Fararo, 1992].

### 3. Methods

Data for the analysis are assembled during the sociological survey of parents of school as part of «Monitoring of education markets and organizations» (Higher School of Economics National Research University, Levada Center).

Project “Monitoring of education markets and organizations (MEMO)” is to collect generalized information and micro data, analyze, generalize and present information on recent trends in education in Russia: on choice of educational programs, funding of education, strategies of educational institutions, overall management, allocation of resources, hiring policies, etc.

Survey was conducted at schools and included 2080 parents. Selection of schools was stratified in the following parameters: 1) geographical location; 2) settlement type; 3) type of educational institution; 4) form of ownership.

### 4. Findings

The research has shown that a number of aspects of participation of children in extracurricular activity and uses of free time (in particular, the period of summer vacation) differs depending on such parameters of families as material prosperity, education level of mother, and also the place of residence, i.e. inequality in access to extracurricular activity and opportunities of the productive organization of free time.

Education level of mother is the factor causing quality of the organization of free time and efficiency of use of the vacation period.

Unlike general education, in extracurricular activity students can decide whether they continue or interrupt studies, and also have an opportunity to attend several clubs and sections at once. Thereby chances to find the programs meeting interests and abilities of the child, allowing to disclose his or her talents increase.

The data obtained during the research demonstrate that kids of more educated mothers (those that have higher education, including unfinished or two degrees or scientific degree) interrupt studies more often and on a more frequent basis combine attendance in one circle with additional classes in other places.

Trajectories in extracurricular activity of children in families where mother has a only secondary or vocational education are more continuous. It is possible to assume that mothers with higher education level differ in strong search activity and attention to results — to the fact that the child receives from additional courses while other mothers are satisfied by the fact that the child "is busy".

Both income level and education status of families are connected with the choice of programs of extracurricular activity.

The greatest shares of those whose children are engaged at music or art schools now, are noted in groups of the parents having one or two higher educations. Among the children studying at art schools, there are many pupils of high-level schools. Statistically significant connection between participation at art schools and family income level isn't revealed.

On other side family income level plays a key role in sport activity. The greatest shares of parents which children engaged in sport are among wealthy families. It's not surprising: the purchase of a sports uniform and equipment requires big expenses.

In the large cities children are involved in extracurricular activity earlier and in bigger volume, than their peers in towns and rural settlements.

We assume that the features of participation in extracurricular activity of the children living in villages and towns which can be regarded as manifestation of inequality in access to this type of education can't be explained with exclusively transport and material barriers. They can be connected also with the low level of an involvement of parents in these settlements in education of children, insufficient knowledge of the available opportunities and lack of desire to use them. This assumption needs to be checked for development of adequate measures for overcoming inequality in access to extracurricular activity of the children living in small cities and villages.

Both existence, and scale of the distinctions revealed in a research and probably feature of manifestation of inequality in access to extracurricular activity are to some extent caused by specifics of this type of education and its organization in Russia: non-obligation of participation in extracurricular activity; a possibility of involvement of several programs at the same time both on budgetary, and on a paid basis; wide variability of programs and the organizations providing them; remarkable information asymmetry.

More educated families showing activity in search of offers and having more developed skills of the analysis of the market get advantages before families with low education level in these conditions.

The data obtained in a research allow drawing certain conclusions concerning state policy in the sphere of supplement education, the organization of children's free time during vacations. In particular, the strategy of increase in coverage of children with programs of extracurricular activity through increase in number of the free-paid programs can be unproductive concerning overcoming inequality in access to this type of education. Children from families with high education level first of all will benefit from such policy, and children from families with the small volume of the human capital will be able to use the benefits only after saturation of needs of the first group [Lucas, 2001].

Therefore the state policy for children from families with poor social and economic background and the children living in rural territories probably has to combine two types of instruments:

- creation of means of informing and increasing of motivation of parents to inclusion of children in extracurricular activity: providing information on opportunities of receiving free extracurricular activity, support in the choice of programs, tutoring, etc.;

- organization of social support of families: introduction of vouchers for services of extracurricular activity of children; quoting of the free-paid on high-quality programs of nonformal education (including realized by the museums, the modern centers of the educational leisure, countryside educational camps); target financing of afterschool programs at rural schools, and also in schools working with students from low-income families.

## 5. Conclusions

Growth of number of empirical proofs of influence of extracurricular activity on the academic achievements, development and socialization of children are caused by relevance of expansion of a research of distinctions between different groups of children in participation in extracurricular activity, and also factors and conditions of emergence of inequality in access to it.

The contribution of extracurricular activity to inequality of educational opportunities and, more widely, in crystallization and reproduction of social inequality becomes especially significant object of research and a subject for discussions. It is possible to assume that this contribution will increase in process of growth of the importance of sector of non-formal education. Non-formal education will be used more actively by families as means of differentiation so its role will be similar to a role of elite schools.

Special studying is demanded by the features of strategy of different groups of families in the market of services of extracurricular activity caused by its specifics (variability of the offer, high level of information asymmetry).

Deepening of researches in the considered area will promote formation of more reasonable state policy in which the problem of development of the sphere of extracurricular activity is combined with expansion of access to his resources for children from different social groups.

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# INVESTIGATING THE USE OF VIRTUAL ENVIRONMENTS IN EDUCATION TO ENHANCE STUDENTS' PERFORMANCE IN THE KINEMATICS GRAPHS

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## Abstract

There are various methods to teaching and learning and simulation, as a practical component of study, can be used to stimulate and enhance teaching and learning in the classroom. The researcher investigated how efficiently and effectively does the results of simulation activities mean to learners and teachers and how teachers can use it as method of teaching to instill curiosity among learners to apply that knowledge in their daily life environment.

The study was conducted with first year physics students. Sixty three (63) of these students participated in this study. Students had to do a kinematics experiment in a laboratory measuring position vs time and velocity versus time. The purpose of the experiment was to determine the slope (average velocity and acceleration) and area (displacement) of these graphs. Then they performed the experiment using technology known as The Physics Education Technology (PhET) Interactive Simulations Project. The results indicated that students made sense of what they are supposed to and what the experiment is about after simulation experiment. They managed to identify and correct their mistakes from the laboratory experiment, hence their keenness to redo the experiment in the laboratory. PhET Interactive Simulations helped them to go back to the laboratory and perform the experiment better, hence being able to obtain required data, analyse and interpret data and results. They could then be able to use algebraic knowledge of functions and graph to predict type of graph and solve kinematics formulae to interpret results (collected data and resulting graphs).

It is anticipated that this study will assist the physics lecturer on how to enhance conceptual understanding of kinematics graphs, but not replace practical laboratory experiments with laboratory experiments. It will also help to enable them to apply and relate knowledge of algebraic functions and graphs in order to solve kinematics problems and graphs. It will still, except gaining conceptual understanding and knowledge of subject content, also enhance the laboratory experiment skills and techniques on how effectively and efficiently they can conduct physics experiment in the laboratory.

**Keywords:** *Simulation, kinematics and algebra graphs, conceptual understanding, learning and teaching, MBL, robotics.*

## 1. Introduction

In recent years there have great emergence, rise and need for technology and its uses in our society and the world to advance economic freedom. Technological use is being and has been developed on daily basis to achieve this freedom and sustainable development of the communities and the world in the form of teaching. Academic life also in the form of research, teaching and learning has also taken a giant leap to advance and empower students and academics to perform at their level best with the use of technology. It has also been reported that how students learn, can be implicitly and explicitly influenced by how the teaching is done (Setlalentoa, 2015). Therefore, as academics or educators, in adopting and taking advantage of technological tools available and at our disposal, we can enhance conceptual understanding of subject-content learning within our students. That does not mean we cannot come up with other technological inventions that could facilitate teaching and learning.

Various researchers (Laws, 1991, Canham, and Hegarty, 2010 and Sokoloff, Thornton, Laws, 2011, etc) have used technologies such as Microcomputer Based Laboratory (MBL) to help students to sketch kinematics graphs by replacing data. MBL did not develop the construction of graphs skill in students instead robotics were used to develop drawing and interpretation skills of kinematics graphs

(Mitnik, Recabarren, Nussbaum and Soto, 2009). This paper will report on the effective use of MBL and robotics (calculations and simulation) to enhance graph comprehension in the teaching and learning of kinematics. Science (physics) is more about content knowledge of subject matter, like kinematics graphs, in the form its conceptual and practical understanding. Therefore, learners need to acquire scientific literacy and teachers should have process skills as well as values and attitudes required in science to couple their subject content knowledge (Bosman, 2009).

Another interesting development in the technological strategies of teaching and learning, which is a focus of this study, is the PhET Interactive Simulation project in the Teaching and Learning of Physics discovered by University of Colorado at Boulder (Perkins, Adams, Dubson, Finkelstein, Reid, and Wieman, 2010). This project or technological tool is design as a continuous attempt to give full guidance that could be used to enhance the teaching and learning of subjects like physics, chemistry, biology, mathematics and so on. Perkins, et al., (2010) stated that simulations as technological tool can be used as a teaching strategy and can be used to emphasize the importance of real life phenomena as well as its underlying science. They further stated that expert physics and or science educators make use of it to illustrate and demonstrate the visual and conceptual models accessible to students. This will improve the connection between what teachers are required to know and how their students think. It is as an extremely useful guide development of effective teaching (McDermott and Redish, 1999).

Rutten, van Joolingen, van der Veen, (2012) reported that computer simulations serve as an educational purpose with the intention to change knowledge and/or skills that can be measured and compared quantitatively. Various researches have been carried out and as strong evidence that simulation can improve and support the traditional of teaching and learning in the classroom as well as in conducting experiment in the laboratory (Rutten, et al., 2012). They further argued that it is a only pity that the effect of simulations in support of the teacher, event of a lesson and place of computer simulations have not been included in the curriculum.

Interpretation and visualisation of slope of a line graph in the physics context than in the mathematics context has been problematic to first year physics student (Phage, 2015, Planinic, Milin-Sipus, Susac and Ivanjek, 2012). They further concluded that lack of mathematical knowledge is not a cause for student difficulties with problem solving and graphing in kinematics. Various researches have also proven that there is a serious confusion among students on the concept of slope and or height in both kinematics and algebraic graphs (Phage, 2015, Planinic, et al., 2012, Friel, Curcio and Bright, 2001). Rutten, et al., (2012) also reported that previous studies have proven that students' conceptual understanding have been enhanced after performing simulation in addition to traditional method of teaching. They based their argument on the fact that students have scored higher in simulation tasks than in traditional teaching, hence simulation can be used to complement traditional teaching and facilitate in the understanding of algebraic and kinematic conceptual terminologies and graphs and equations/functions

## **2. Research Design**

In this chapter, a discussion of the mixed-method approach which involves both quantitative and qualitative aspects of analysis will be done.

Students were given a questionnaire composed of related topics from Linear functions and graphs (Mathematics) and Kinematics graphs and equations (physics). This will be supported by interviews with a sample of students who wrote the test to investigate whether they could integrate their knowledge

## **3. Research Objective**

This paper investigated how simulation can enhance the learning of kinematics equations and graphs especially using knowledge of algebraic functions and graphs as well as information learned from a Mathematics class.

## **4. Research Method**

A qualitative phenomenological study was conducted which probed the way first year undergraduate physics students comprehend and show the conceptual knowledge with the aid of laboratory experiments and simulation experiments. A case-study qualitative research was followed in order to investigate the natural setting.

The pre-experimental laboratory pre-test-post-test research design, with a simulation experiment in between, was conducted with a view to determining the effectiveness of the inquiry-based teaching and learning sequence (inductive to deductive) intervention. A follow up interviews with a selected focus group was conducted to probe what students have learned.

#### **4.1. Participants and Setting**

A qualitative case-study research was done with a group of sixty three (63) first year undergraduate physics (Introductory Physics) students in the BEd (FET) Natural Science programme at CUT.

#### **4.2. Data Collection**

The students' physics laboratory experimental manual was used as a pre-test and post-test activities. The students had to perform the experiment practically in the laboratory. They collected data, analysed it, plotted the corresponding graph, interpreted it as well extrapolate info from it, and then did tasks based on this graph and data collected. They submitted the lab reports for evaluation (marking) on completion.

The constructs or aspects of investigation from both algebraic and kinematic point of view were based on area (displacement), gradient (average or instantaneous velocity and acceleration), reading coordinates and type/shape of graphs (manipulation of equations and problem solving).

Thereafter the students performed simulation experiment of the same activity using PhET Interactive Simulation tool in the computer laboratory. They had to perform a "Motion Man" simulation experiment about distance, velocity and acceleration, all of them versus time. They also had to use the collected data, graphs to determine respective average/instantaneous velocity and acceleration (gradient of the graph) and displacement (area of the graph). There it was easier as data in terms of displacement was available and the computer was recording the time, velocity and acceleration for them. Calculations were also computerised for them based on the information they supplied. They only have to manipulate the displacement to get varying values of corresponding change in velocity and change in acceleration. They could then notice the sequence of how changing displacement affects the sequence of change in velocity and change in acceleration. The respective graphs could also been noticed and how they are formed.

Calculations also were noticed from the graph as well as extrapolation of information to do and answer pertinent questions and resolve the unknowns. The simulation experiment brought a lot of curiosity to the students to redo the experiment practically in the physics laboratory. They had lot of unanswered questions, which they felt they could now detect and answer. Students were then allowed to redo the experiment as a post-test. They had to submit experimental reports independently for the re-evaluation and before performing the next experiment. The experimental reports together with the results of focus group interviews were used as data.

#### **4.3. Data Analysis**

The reports of the three experiments, pre-lab, simulation and post-lab were marked. A comparison of individual student' performance on each experiment was analysed statistically, i.e., the results of how one student performed in each experiment was done. One student was evaluated in all experiments and his /her performance in each experiment was compared. The overall performances of students in each experiment were also compared.. The results showed varying degrees of performance. The results of the interviews were also analysed for significance and reliability of students' conceptual understanding and knowledge of kinematics and algebraic graphs.

To ensure reliability of the constructs investigated, Cronbach Alpha (CA) coefficients were calculated. This was to determine the reliability and consistency of these constructs and to measure if they are acceptable. CA coefficients/values are acceptable if they are 0.6 and above, i.e.,  $CA \geq 0.6$  (Field, 2005). This paper seeks to investigate how simulation can enhance the learning of kinematics equations and graphs especially using knowledge of algebraic functions and graphs as well as information learned from a Statistics class.

This paper seeks to investigate how simulation can enhance the learning of kinematics equations and graphs especially using knowledge of algebraic functions and graphs as well as information learned from a Statistics class.

## 5. Results

From the results of the pre-test, the researcher observed that nearly all CA values were below 0.6. This might be due to difficulty with which students experienced or lacked in comprehending the conceptual knowledge of the experiment.

In the simulation and post-test experiments, all CA values were above 0.6, confirming a measure of reliability and consistency. In the simulation experiment, performance was enhanced by playing with simulation activities and computerised graphs and calculations. In the case of post-test experiment, above 0.6 CA values can be attributed to inquiry and constructivist deductive learning from inductive learning. The results of the post-test were further enhanced by the students' curiosity and interests to redo the practical laboratory experiment and prove what they have learned and correct their previous mistakes/confusion or misconceptions.

The results indicate students performed better after the post-test, with an indication that they were confused in the pre-test and simulation helped them to clear the confusion. A result that proves that learning occurred from inductive inquiry stage to deductive and constructivist stage. They were therefore able to ask and answer theoretical questions on the concept of task/activity they performed, indicating an enhancement in the understanding and knowledge of the concept.

## 6. Discussions

Student performance was evaluated for carrying out the experiment, laboratory report quality, experiment problem-solving and results of a written test. The researchers found that using the preparatory simulation leads to better comprehension of the techniques and basic concepts used in their laboratory work. The students with the greatest learning deficiencies profit most from using the pre-laboratory program (Rutten, et al., 2012)

Introducing laboratory work with a preparatory computer simulation lead to students asking more theoretical questions during laboratory work and showing more chemistry knowledge while being interviewed. The authors therefore conclude that preparatory exercises intended to help students integrate their theoretical, conceptual knowledge into schemata can allow room for reflection, but may also contribute to students having a better sense of direction during their laboratory work. In a similar fashion, Limniou, Papadopoulos, Giannakoudakis, Roberts, and Otto (2007) showed that replacing part of a laboratory session on the topic of viscosity with a collaborative pre-lab simulation exercise can improve content knowledge.

Initially as a former physics laboratory technician (also responsible with the marking of students' physics laboratory's experimental reports) and now a physics lecturer, I have observed that students in class were motivated and their potential determined from incorrect procedure. Afonso, 2007 and Nhalevilo, 2012, emphasized that in many classroom situations, logical positivism should predominate and that this will lead to deductive inquiry based learning from inductive type. In this manner the researcher investigated and proved that why students could get expected results according to the laboratory manual or what reasons are there for them to obtain different (incorrect) results. Even though most of the students here were able to rectify their mistake in the post-test from pre-test, language and cultural background seemed to be a barrier their incorrect results was their deterrent factor corrected with simulation activities.

To overcome cultural and language barrier, simulation can effectively be used to emancipate students' deductive learning as expected through laboratory experiments. The issue of graphs in algebra and kinematics in terms of collection of data, their drawing, analysis, interpretation and extrapolation of information from them to solve problems, were then easily comprehended by students after simulation experiments. Students now understand what is happening and the meaning of it, i.e., critical thinking and curiosity will be and is instilled in them. The educators and laboratory technicians/instructors will also therefore not only consider mistakes the students make and how to counteract that/them (reasons for wrong or incorrect results).

## 7. Conclusions

Simulation experiments seems to be of vital importance and significance in enhancing first year physics students' conceptual understanding and knowledge of kinematics and algebraic graphs and equations/functions. It also helped them to be able to associate the different variables or terminologies used in kinematics with their corresponding algebraic variables, plot and comprehend such graphs, extrapolate information and solve problems (do calculations).

## 8. Potential implications

Based on the results obtained in this study, simulation experiments can therefore be used to compliment conceptual understanding and knowledge of the subject content. But it cannot be used replace hands-on (practical) laboratory experimental work. In fact they can also be used to help students acquire techniques and laboratory skills required to perform an experiment and handling tools/equipments in the laboratory. It can used to support teaching and learning through inductive to deductive inquiry based learning. It also will enhance constructivism teaching and learning approach according to Piaget and Vygotsky theories of learning.

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**POTENTIAL OR PROBLEM? ANALYSING SECONDARY SCHOOL  
TEACHERS' CAUSAL ATTRIBUTIONAL OUTCOMES OF STUDENTS WITH  
LEARNING DISABILITIES**

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**Abstract**

Despite strong support for inclusive education in principle, many teachers and administrators still demonstrate mixed responses to the inclusion of certain students in their classrooms. Students with specific learning disabilities (SLD) form a large group of students in inclusive classrooms yet some provincial, state and national jurisdictions fail to acknowledge the existence of these students. Not acknowledging and understanding these students can deny them the recognition and resources necessary for their genuine participation in education and, in turn, society. The aim of this study is to examine British in-service secondary teachers' attributional responses to students with and without specific learning difficulties. The participants included 122 British secondary school teachers who were surveyed in response to vignettes of hypothetical male students who had failed a class test. The study found that while teachers attributed more positive causes towards students without SLD, they exhibited more negative causes towards students with SLD. Teachers' causal attributional outcomes of students' level of achievement can impact upon the students' own attributions, with teachers' responses for students with SLD having the potential to, unintentionally, influence students' own sense of self-efficacy and motivation. If students with specific learning difficulties are to achieve their full potential in inclusive classrooms, the students and those within their learning environment must recognise and foster their ability to succeed. Moreover, if education systems truly aim to make a paradigm shift towards inclusion for all and understand the needs and abilities of students with specific learning difficulties, focus needs to be put on systemic support at the leadership level to help teachers achieve this. The paper concludes with a consideration of the implications of the research and recommendations for practice.

**Keywords:** *Attribution theory; specific learning difficulties; in-service teachers; inclusion.*

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# INCLUSIVENESS IN THE ONLINE CLASSROOM: A STRATEGIC PLANNING APPROACH

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## Abstract

Based on the theory of strategic process and development, this paper provides a road map through which online course content can be brought into compliance with current regulations regarding accessibility as well as applying principles of universal design for learning (UDL). Strategic planning, which can be applied to many aspects of organizational life, refers to a “systematic process of envisioning a desired future, and translating this vision into broadly defined goals or objectives and a sequence of steps to achieve them” (Schmidt & Laycock). Turning that concept slightly, this paper advocates planning strategically to achieve accessibility in online courses, the outcome of which is that institutions of higher learning will ultimately provide students with the knowledge and tools to operate both within the university environment and beyond. While it is clear that colleges and universities have a legal responsibility to make their course content accessible to those students who may be deaf, blind, have a permanent or temporary physical disability that would inhibit their access of online course content, they also have a moral obligation as well to create courses to accommodate students with different learning styles.

**Keywords:** *Accessibility, universal design, WCAG2.0, disabilities, online courses.*

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## 1. Introduction

The majority of colleges and universities have some online courses or online educational programs available in some disciplines (Allen & Seaman, 2013). But in most cases, online program development at many institutions has been ad hoc, decentralized and episodic. Not infrequently, the online offerings in many universities are segregated in continuing education and professional development divisions and kept apart from the main academic enterprise, therefore, creating online courses and online programs can come from many different stakeholders in the university ranging from individual professors to non-academic administrators and even, in some cases, boards of trustees, depending on the particular circumstances of each institution (King & Alperstein, 2015). As such, there is no centralized function for implementing accessible course content based on universal design for learning principles

While the place of online education within institutions of higher learning may vary greatly, one of the key benefits of online education is its appeal to a wide range of students, from older students who seek an advance degree, but have no experience in the online environment to digital natives; younger students who have grown up in a digital world. Each of these types of students brings with them to the online learning environment varied learning styles. Moreover, the National Center for Education Statistics reports that as of 2012, students with disabilities accounted for approximately 11 percent of undergraduates in post secondary institutions (Digest of Education Statistics, 2014).

As the establishment of online programs is so varied, institutions of higher learning, have not responded to the degree or speed that is required by regulation and called for through moral imperative to accommodate various types of learners. From an institutional perspective, to an extent, creating accessibility in online courses is kind of like the game of hot potato. In this sense, the issue keeps getting tossed around, as the literature points out despite online education’s potential for teaching within the principles of accessibility and universal design, few faculty members are trained how to teach online (Smith & Rhoades, 2006).

In a study of college administrators, Linder, Fontaine-Rainen, & Behling report that those administrators they interviewed report that many faculty members have gone “rogue” by not meeting compliance requirements for accessibility for online courses (2015). They elaborate by stating that training faculty may take place within a time consuming one-on-one training, which they deem as an

inefficient approach. On the other hand Lombardi, Murray & Dallas surveyed faculty in order to measure their attitudes toward accessibility and inclusive course design. They concluded that training was essential regardless of gender in affecting attitudes (2013). According to their study, faculty who had prior training, regardless of gender and university, had higher awareness of and need to support students with disabilities.

The purpose of this paper is to outline a framework for planning strategically through the establishment of a network of those with a vested interest in creating accessible online course content based on universal design. The paper advocates planning strategically for accessibility and universal design for learning.

## 2. Planning Strategically for Accessibility and Universal Design for Learning

Strategic planning, takes its cue from business planning. Johnson and Scholes offer the following definition of strategic planning: “Strategic planning helps determine the direction and scope of an organisation over the long term, matching its resources to its changing environment and, in particular, its markets, customers and clients, so as to meet stakeholder expectations” (1993). The application of strategic planning methods to accessibility and universal design for learning is novel, among other reasons, because institutions of higher learning are not organized in the same manner as other types of organizations.

### 2.1. Framework for Planning Strategically

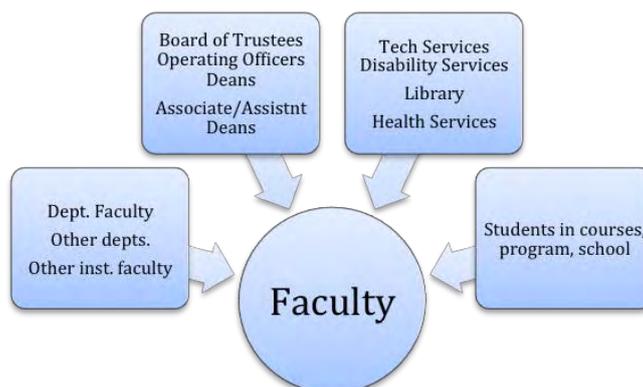
Planning strategically is somewhat different than the kinds of strategic plans developed by institutions of higher learning (Collins & Porras 1995). Strategic planning in higher education has not been demonstrably effective and often is considered by many in the academic community as either a waste of time or a vehicle for senior administrators to try to assert their control over the direction of the institution and, as a corollary to the assertion of control, something to be ignored, or, in the worst case scenario, resisted. Against that backdrop, many middle level administrators and faculty members do not think it is within their domain to engage in strategic planning processes.

Instead of trying to create an all-encompassing path forward, the approach advocated here takes the position that stakeholders should be strategic about the areas they chose to address in their planning. After a guiding vision is established and the internal and external environments are sufficiently understood, the critical questions posed in planning strategically are: What can be done now? What can be done next? What can be done that will actually move the online program towards fulfilling its vision? What are the obstacles to be overcome in to successfully take those steps? Is it possible to overcome those obstacles and if so, how? These questions lead us to changing the institution’s culture as planning strategically is developed and nurtured on an ongoing basis and applied systematically to solve related problems and challenges ranging from enculturating students into a world of accessibility or finding funding to support closed captioning of videos.

Unlike in the corporate world, in higher education the lines of communication between the organizational silos typically are weak or non-existent. Institutions of higher learning vary greatly in their organizational structure, which presents challenges posed by having a tradition of shared governance overlaid on an organizational structure made up of rigid operational siloes that are multiplied, as for example where universities have many different schools. Perhaps the most significant initial barriers to planning strategically are cultural and political.

### 2.2. Creating a planning network

Figure 1. Strategic Networks.



Planning strategically offers several advantages to the traditional way of thinking about strategic planning. For example, while senior management controls how the resources of an organization are deployed, those closer to the operational front lines have a better understanding how resources are developed, cultivated and actually used. In short, organizational knowledge is more firmly grounded at the operational level, and it is the people who are closest to the front lines who actually know what the front line looks like.

In the corporate world middle usually refers to middle management, but within institutions of higher learning the middle refers to the semi-autonomous status of faculty who operate between the administration and related services and students. For example, rather than a hierarchical structure, universities may operate through shared governance. Figure 1 represents the network, based on linkage theory of those connected by the issue of accessibility and UDL. As individual faculty members play a central role in course creation, they are placed at the center of the network. Creating a planning network as opposed to a planning committee offers several advantages: alerts the key planners to barriers and obstacles any specific idea may ultimately encounter; helps identify and clarify the needed approval processes; alerts key stakeholders about new ideas and proposals early; and recognizes that for any plan to succeed, it must be effectively communicated to larger constituencies in the university (King & Alperstein, Forthcoming).

### 3. Applying the Framework

In order to plan strategically, a pilot study was undertaken with the faculty of a relatively small online graduate program. The study was undertaken to better understand faculty attitudes after having been exposed to an online teaching workshop, including training in accessibility and UDL principles. The instructors were asked about their prior knowledge of accessibility and UDL, and they were asked about who they felt should be responsible for implementing accessible course materials into their online courses. They were also asked about inhibiting factors regarding their implementation of accessibility with regard to time, knowledge, compensation and training.

*Table 1. Faculty Attitudes Toward Accessibility and Universal Design for Learning.*

| Attitudes & Awareness                             | Percent Yes |
|---|-------------|
| Awareness of need to accommodate students         | 89          |
| Familiarity with UDL                              | 44          |
| Have implemented accessibility                    | 56          |
| Reasons for not implementing Accessibility or UDL |             |
| Not clearly demonstrated                          | 25          |
| Need more time to acclimate                       | 100         |
| Need more time to practice                        | 100         |
| No time for new tasks                             | 25          |
| Whose responsibility                              |             |
| Instructor  | 88          |
| Disability Services                               | 50          |
| Technology Services                               | 75          |

Table 1 indicates that while faculty are aware of the need to accommodate students with disabilities; they were not as familiar with principles of UDL. After having some training, slightly more than half report implementing some aspect of accessibility into their online courses including Word, PDFs, video captioning and email. Faculty were clear regarding their obligation to make their courses accessible, but they also felt it was a shared responsibility with disability services and technology service departments. In other words, faculty were not clear regarding upon whose shoulders making courses accessible rests.

While a majority of faculty understood how to implement accessibility and UDL after attending the workshop, they universally reported needing more time to acclimate to doing things in a new way, and they needed more time to practice. Some faculty stated they did not have additional time to take on new tasks.

#### 3.1. Stakeholder analysis

With a better understanding of faculty attitudes and knowledge, a stakeholder analysis was developed to assess the climate for change. Lewin puts forth a process for identifying the forces that either drive a strategy forward or offer resistance. He referred to this process as a Force Field Analysis

(Lewin 1951). “Force Field Analysis is a general tool for systematically analyzing the factors found in complex problems. It frames problems in terms of factors or pressures that support the status quo (restraining forces) and those pressures that support change in the desired direction (driving forces). A factor can be people, resources, attitudes, traditions, regulations, values, needs, desires, etc. As a tool for managing change, Force Field Analysis helps identify those factors that must be addressed and monitored if change is to be successful” (Force Field Analysis, n.d.). The analysis in table 2 exemplifies the forces for and against change that one might expect with regard to implementing an accessibility policy. The analysis helps to consider who or what might drive the policy forward, and it is also important to determine that which would offer resistance to change, which might include persons, habits, customs, or attitudes.

### 3.2. Force Field Analysis

Table 2. Force Field Analysis.

| Forces for Change                     | Forces against Change         |
|---------------------------------------|-------------------------------|
| Sections 504, 508, WCAG2.0            | 2 year moratorium proposal    |
| 11% of students with disability       | Limited resources             |
| Variation in Learning Styles          | One size fits all classroom   |
| Tech innovations                      | Added level of time and work  |
| Recognition change is needed          | Entrenched cultural practices |
| Accessibility on ad hoc basis         | No one in charge/taking lead  |
| Disability & UDL social justice issue | lack of awareness/knowledge   |

The seven driving forces listed above are positive, reasonable, logical, conscious and economic. The seven corresponding restraining forces are negative, emotional, illogical, unconscious and social/psychological. According to Lewin, both sets of forces are very real and need to be taken into account when dealing with change, or managing change, or reacting to change. However, Lewin suggested that change would be easier and longer lasting if the forces against change were reduced, rather than the forces for change being increased.

### 3.3. Mission Statement

With an understanding of faculty attitudes and knowledge as well as an understanding of the forces that are working against change that need to be reduced, consistent with planning strategically, the following mission and goals were created to support the execution of a disability policy. The mission statement for Accessibility Resources & Service is presented in two parts: Goal - To assure that all programs and facilities of the University are accessible to all persons in the University community; and, Philosophy - To develop programs and services that permit students to, as independently as possible, meet the demands of University life.

## 4. Discussion and Conclusion

Based on the planning process developed here, faculty play a central role in facilitating change within the institution. Faculty are in the best position to create a network of strategic partners to facilitate institutional change. However, they cannot change the culture alone. While faculty in this pilot study did not believe that compensation was a deciding factor with regard to implementing accessibility and universal design, time and practice were important. Initial training does not go far enough, although research has demonstrated that training does lead to a change in attitudes. Ongoing training sessions whereby faculty can learn to adopt newer techniques will require support from the administration. An investment in resources, like closed captioning services are required, and a regular review of technologies is essential to determine which ones can more easily be adapted for accessibility.

The power of the 21<sup>st</sup> Century instructor is not just in the information shared but the opportunities created for all students to learn how to learn, solve problems, and apply what they are learning in meaningful ways. This requires instructors to make their content accessible to all students and to employ universal design in order to accommodate various learning styles. In order to achieve these goals, they must collaborate with other stakeholders in the institution. In the end, rather than giving up power and authority, they gain much more: students who effectively learn within learning environments, the outcome of which may be measured both within the classroom experience and beyond.

Concern for accessibility is a worldwide issue. The United Nations Convention on the Rights of Persons with Disabilities established that all people despite the type or severity of their disability have the right and opportunity to participate in education and to develop fully their personality, talents, creativeness and physical skills without discrimination (United Nations n.d.). And, The Council of Europe policy on Disability Policy 2006-2015 declares that all people who have a disability independently of its nature or degree have equal access to education and to develop their full personality, talents, creativity, and intellectual and physical abilities (European Commission 2010).

Planning strategically is one way that institutions of higher learning can begin to implement principles of accessibility and UDL in their online courses. Planning strategically can have a significant impact on the success of an institutional-wide planning process through networks of stakeholders supporting faculty through every step of the process from information gathering to implementation an assessment of learning outcomes.

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## THE NEOLIBERAL REVOLUTION IN EDUCATION: THREE INSTRUMENTS FOR DIAGNOSING AND ADDRESSING THE PROBLEM

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### Abstract

Neoliberalism has had a devastating effect on the management of schools and universities. This paper identifies and outlines the problem, and then discusses *the social space and ethical action theory* which encapsulates three heuristic instruments for adequately understanding and addressing the problem, namely those of sphere sovereignty, sphere universality and ethical action within the relevant social (i.e. pedagogical) space. The thrust of the paper is that whereas before we had an intuitive “suspicion” that all is not well with schooling, teaching and learning and academia that are in accordance with the neoliberal orientation, we now have particular heuristic instruments at our disposal to help us understand the problem and to address it more effectively.

**Keywords:** *Neoliberalism, schools, universities, social space and ethical action theory, education.*

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### 1. Purpose of this paper

The central theoretical argument of this paper is (a) that the minds and habitus of many people all over the world have been colonized by the neoliberal frame of mind, and that this view of reality has impacted on teaching and learning, schools and universities, and (b) that this state of affairs can be countered by means of the three heuristic instruments encapsulated in *the social space and ethical action theory*. To expound this thesis, I shall begin by outlining the meaning of “neoliberalism” and how it has become part of how we see our life-world and education. The remainder of the paper will then be devoted to how we could use the instruments encapsulated in the social space and ethical action theory to counteract the influence of neoliberalism in schools and universities as institutions of teaching and learning.

### 2. The term “Neoliberalism”

A study of the literature on this subject shows that it is difficult to arrive at a precise definition of neoliberalism. As Hall (2011: 10) has correctly concluded, the term lumps together a wide variety of circumstances and conditions, and does not refer to a single entity. It could be said, however, that it is a view of the world and of life that has permeated the actions of late 20th and early 21st century thinkers and has had a great impact on education (teaching-learning). For neoliberalism, the economic and business reality are more important and of greater significance than all others in our life-world. It sees all of us as rational choosers as consumers of commodities, among which education (Adams, 2006: 8). According to neoliberalism, the social realm works best if run along “pure forms of rationality” such as the laws of supply and demand. These laws should be allowed to operate unfettered by interference in the form of control over, for example, the dangers of monopolies or exorbitant profitmaking, and even threats to the environment or social welfare (Welch, 1998: 159). In this way, according to Welch (1998: 159), people are increasingly being made captive to the argument that life, including education, must be run along business lines to be efficient. Neoliberalism works gradually (Sparkes, 2007: 532) and stealthily towards the colonisation of and even the closing-down of people’s minds and consciousness (Ball, 2003: 226). The end result is that people, also academics and educators at all levels, become “ultimate docile bodies” who have internalised the precepts of neoliberalism (Sparkes, 2007: 532). In Bourdieu’s terms, neoliberalism has succeeded in colonising the habitus of many people, including those of educators and educationists (Maistry, 2014: 60).

The economisation of every sphere of life, free markets, entrepreneurship, the free “possessive” individual, private property, a hands-off state, profit-making, social life as social capital and people as human capital, the notion that people are paid what they are worth, striving for market advantage, are all key ideas of neoliberalism. These key notions are also inadvertently applied to non-business and non-economic spheres such as education and educational institutions (see Marois & Pradella, 2015; Shenk, 2015).

### 3. How neoliberalism has impacted on education and educational institutions

Neoliberalism has had a profound impact on education, particularly on how educational institutions see themselves, their functions and their management.

- Institutions of (higher) learning are often portrayed as business enterprises (Conradie, 2011: 424) or as business corporations (Rustin, 2016: 154). The educationists who lead and guide such institutions are consequently seen as “business” managers (Solomon, 2016: 13).

- The management of these institutions has been emphasised to such an extent that it has been referred to as managerialism (Jansen, 2009: 144). School and university leaders are assumed to work within “managerial regimes” and a “managerial complex”. Managerialism finds expression in striving to continually improve the efficiency (in terms of financial costs) and the status of the institution, its public image, assessment of staff and programs, external evaluation processes, application of the “rewards and punishment system”, greater efficiency and performance, a close linkage between the institution’s educational programmes and the economy, total quality management and public accountability (Adams, 2006: 4, 8; Welch, 1998: 171) and also international involvement to the extent of transnationalism (Huntington, 2005: 257).

- Managerialism claims that there is nothing distinctive about education; it can be managed like any other service or business (Adams, 2006: 8). Even academic achievement is rendered as striving for “productivity targets” (Ball, 2003: 218). Education is seen as the acquisition of “social and human capital” and teaching and learning / academia is seen as a part of the institution’s entrepreneurial culture (Rustin, 2016: 156).

- Everything that is done in the institution is subject to the processes of performativity whereby the optimisation of the institution’s performance becomes the ultimate goal. The performance of individuals and institutions of higher learning serves as a measure of productivity or output, of displays of quality or “moments of promotion or inspection” (Ball, 2003: 216).

- The managements of educational institutions are urged to be aware of the play of market forces (Conradie, 2011: 426), and that they should focus on producing citizens able to participate effectively in a global economy (Adams, 2006: 3).

- Educational institutions should work towards productivity (Conradie, 2011: 427) and profit-making (Rustin, 2015: 150). They should be guided to become locally, nationally and globally competitive. Knowledge has become commodified and branded (Conradie, 2011: 427, 432).

- Educational institutions tend to see students as clients and consumers of academic and educational products (Fevre, 1997: 20), as people investing in their own futures (Rustin, 2016: 158).

### 4. The root of the problem

Educationists with insight into the different areas of specialisation of schools, colleges and universities on the one hand, and of business enterprise and of corporations, on the other, will intuitively feel that something is wrong with the picture painted above – the picture of institutions of teaching and learning such as schools, colleges and universities being managed as if they were business corporations, and as if the norms and principles of business were applicable in what they do or fail to do, that institutions of learning and teaching are managed according to norms such as profitmaking and efficiency calculated in financial terms. If we had still lived in an undifferentiated society (Verburg, 2015: 309) where widely different forms of social life and existence were inextricably intertwined, one could have been pardoned for not being aware of the incorrectness of expecting schools and other institutions of teaching and learning to adhere to the norms of other forms of social life such as business corporations or the church. However, we now live in times of greater insight into the relationships between the various institutions in our life-world. We have, as Verburg (2015: 309) has correctly argued, developed a field of knowledge known as philosophical sociology (also referred to as societal relationship theory). This theory enables us to distinguish between the societal relationships in our life-world such as marriage, family, extended family, the school, university, church, sports club, cultural club, business, the state and many more, and how each functions in its own sphere of competency.

## 5. A note on method

Many educationists, i.e. specialists in the field of pedagogy, have an aversion to immersing themselves in the philosophical intricacies encapsulated in *societal relationship theory*. They do not wish to spend time and energy on such an exercise that is often seen as peripheral to the core work of their disciplines. It is in view of this that I have developed the *social space and ethical function theory* (see Van der Walt, 2017). I shall now briefly outline this theory and demonstrate how it will help us get around the neoliberalist problem observable in education, schools and universities.

The *social space and ethical function theory* firstly recognises the fact that individuals, groups and societal relationships such as families, the state, business, school, universities and sports clubs each occupies a particular social space in our life-world, without thereby claiming a superior or overall (absolute, dominating) status for the social aspect of reality. The social is but one of the many modalities of reality (cf. Mahlomaholo, 2014: 172-173; Strauss, 2009: 18, 49). It is important to abstract the social aspect in this manner, however, because it helps us gain an idea of the wholeness and the totality of the act or the event (Strauss, 2009: 57). This also applies to the spatial aspect that I abstract to form part of the notion of a *social space* in which events occur.

The theory secondly suggests that each individual, group or societal relationship has been entrusted with a specific and unique creation mandate, function, aim, purpose or calling. This is known as its qualifying function (Verburg, 2015: 202, 208). Each should pursue its function and purpose with due diligence, responsibility and accountability and with due respect (i.e. ethical care of) for the social spaces, self-determination and functions of all other individuals, groups and societal relationships. Respect in this regard also entails recognition of the twin principles of sphere sovereignty and sphere universality. Since we live in a highly differentiated society (Verburg, 2015: 309) we are in need of principles such as these two to assist us to make the necessary distinctions about the social collectives in our life-world.

The *principle of sphere sovereignty* holds that schools and universities have teaching-learning and academic functions whereas businesses have economic functions and states juridical functions. Each societal collective or relationship has its own basic norm to which to adhere to, and these should not be confused with one another; no societal relationship should ever be reduced to another (cf. Strauss, 2009: 8). This principle helps us understand the differences between the different social and societal structures around us. If this principle, based on a non-reductionist ontology, is not recognised and adhered to, there is the danger of real antinomies arising from the attempt to reduce the irreducible, for instance to reduce the functions of a university to those of the state or business (Strauss, 2009: 43, 60). It is in this confusion that neoliberalism has thrived during the last three to four decades.

The associated *principle of sphere universality* in turn embodies the notion that the various societal relationships in our life-world are not hermetically sealed off from one another. Each of us as individuals functions in a variety of social collectives. Each and every societal relationship gains in meaning and significance if its coherence and interwovenness with all the others are recognised (Strauss, 2009: 24). Every societal institution and every human act in principle has a function in every other different modal aspect (such as the religious, the ethical, the aesthetic, the juridical, the social, the historical-cultural, and symbolic, to mention a few) (cf. Strauss, 2009: 52).

The social space and ethical action theory thirdly suggests, as mentioned, recognition of the *ethical principle of diligent care* of and for the interests of all other individuals, groups and societal relationships. This principle has been variously formulated as loving your neighbour as yourself (Mat 5:43), caring for the person and interests of the other (Stoker, 1967: 231), Kant's categorical imperative (Kenny, 2012: 699), or Rousseau's maxim of doing unto others as you would have them do unto you (Comte-Sponville, 2005: 9). The ethical aspect of reality refers to the domain of normativity, of ought to be (Strauss, 2009: 3) and to sincerity, honesty, integrity and loving care (Strauss, 2009: 101). Respect for the ethical principle will afford social space for all individuals, groups and societal relationships to manifest and express their own meaning in life, thereby contributing value to humankind.

## 6. A way out of the confusion brought about by neoliberalism

When we talk of space it is an indication that we are interested in where something (in this case, teaching and learning) occurs. The answer to this question is that teaching and learning and academia in this particular case occur in the social space of teaching and learning and academic work. This answer implies that only the social-spatial rules of teaching and learning and of academia should be applicable there and that none of the rules, principles and norms typical of (for instance) the state (juridical norms), the family (familial love and blood ties), marriage (love between spouses), business (frugality; striving to earn enough in financial terms), the sports club (kinematic and physical) and so on, are applicable. To

gain clarity about the social space in which teaching-learning and academic activity occurs is in accordance with the principle of sphere sovereignty.

This does not imply, however, that the school and the university are immune or indifferent in their sovereign social space to the other norms mentioned in the previous paragraph. Schools and universities should also conduct their affairs justly (the juridical norm), teachers and lecturers should care for their students and their fellow lecturers (the norm of love and care), they should demonstrate frugality in what they do (they should not waste money or other resources), their work should be dynamic and keep up with the latest developments (kinematic norm), they should make optimal use of physical space and amenities (physical) and so on. All of these norms are obeyed under the over-all guidance of the logical-analytical norm that forms the core of teaching and learning and of academia. In saying this, we have now counterbalanced the norm of sphere sovereignty with that of sphere universality.

The balance between the principles of sphere sovereignty and universality ensures that we never see schools and universities as business corporations and attempt to manage them as such. This does not mean, however, that they do not have to adhere to the economic norm of frugality. Application of the economic aspect of schooling and of university life and activities demonstrates that we as educators and educationists are also interested in the cost of teaching and learning and of the academic programs in question. The economic aspect of reality and hence also of a school or university demands that money and other resources not be wasted. Such waste would be a contravention of the economic norm of frugality (Strauss, 2009: 25, 41). (In contrast, businesses, being business enterprises and not institutions of teaching and learning or of academia, are basically guided by the economic norm of frugality. They have to make profit otherwise they lose their right to exist (Strauss, 2009: 29)).

## 7. Conclusion

The principle is clear: societal relationships should be distinguished from one another on the basis of their leading modal functions and in terms of the sovereign social space in which they perform their respective functions. The multi-faceted existence of the human being is not exhausted or contained by any single societal institution, such as for instance business enterprise. To assume that it is would be to commit the error of reducing the irreducible (in this case education in the sense of teaching-learning) to business, a form of absolutisation or ontological reduction. The principle of sphere universality, on the other hand, helps us understand that human beings fulfil a multiplicity of roles within diverse societal institutions, and throughout their lives, these functionally distinguishable social roles are constantly and concurrently acted out (Strauss, 2009: 42).

Whereas we formerly intuitively knew and understood (felt!) that the effect of neoliberalism on education, schools, teaching and learning, universities was incorrect and indefensible, we now understand why in principle its impact on education and educational institutions cannot be justified: such impact amounts to the transgression of the three principles encapsulated in *the social space and ethical action theory*.

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## THE COMMON CORE DEBACLE: FAILED SCHOOL CURRICULUM REFORM IN THE UNITED STATES

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### Abstract

National Common Core Standards and accompanying high-stakes assessments for evaluating students, teachers, schools, families, communities, and states have led to fiery political and educational blowback in the United States. The Common Core standards were intended to define the reading and math skills that students should be able to do at each grade level. Development started in 2008 when the 2016 high school graduating class was in fourth grade. Critics charge Common Core standards have turned reading into a discombobulated and often meaningless chore for young people and curriculum, especially in schools attended by children from working-class and poorer families, into test prep academies to prefer students for high-stakes tests. The National Assessment of Educational Progress (NAEP) is the largest nationally representative and continuing assessment of what America's students know and can do in various subject areas. Its mandate to test was included in the original No Child Left Behind legislation. NAEP tests are given to a representative sampling of about 30,000 private and public school students every two years in Grades 4, 8 and 12. NAEP, which is administered by a federal agency that is part of the national Department of Education, periodically tests students in math, reading, science, the arts, civics, geography, U.S. history, and technical literacy. By the 2014-15 academic year, every state was required to have in place Common Core aligned assessments to ensure that students were "college- and career-ready." The 2016 high school graduating class was in eleventh grade. In Fall 2015 the NAEP tested a representative sample of high school seniors in the 2016 graduating class. After seven years of Common Core curriculum and assessment, the NAEP tests showed the average performance of high school seniors dropped in math and failed to improve in reading from 2013 to 2015. Performance was also down on both tests from 1992, the first year that similar tests were used. There was a decline in the percentage of students in both public and private schools that are rated as prepared for college-level work in reading and math. In 2013, 39% of students were considered ready for college math and 38% were prepared for college-level reading. But in 2015, only 37% were prepared for college. Worse, while scores improved for students in the highest percentile group in reading, they dropped in reading and math for students in the lower percentiles. The number of students scoring below "basic" in both subjects also increased from 2013. These were the students that Common Core and the high-stakes testing regime were supposedly designed to support the most. Test scores for students in 4th and 8th grade who have been trapped in Common Core classrooms with Common Core curriculum for pretty much their entire school careers showed a similar decline in math.

**Keywords:** *Reform, Schools, Common Core, Assessment.*

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# PROFESSIONAL TEACHING PRACTICES TRANSFORMATION FROM THE USE OF TELESSALA™ METHODOLOGY: CASE STUDY OF AUTONOMY PROGRAMME

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## Abstract

The purpose of this paper is to oral present in the International Conference on Education and New Developments, inside the topic Projects and Trends and sub-topic Pedagogic Innovations, the research developed in the Doctoral Programme in Science of Education at Porto University, Portugal, which aims to understand and analyse the transformations in professional teaching practices of educators who used the Telessala™ Methodology in *Autonomy* Programme in Rio de Janeiro, Brazil, between 2009 and 2014. The motivation to write about this subject came up during the years I worked as an educational consultant at Roberto Marinho Foundation with cities and states government public policies for discrepancy between age and grade correction to youth and adults students of Brazilian public schools, that uses this innovative pedagogic and didactic methodology.

This research is based on a qualitative methodological approach as it believes this work seeks to interpret a unique and complex reality. The option for the case study appears because it is about a specific matter and so need to describe it in detail, conceptualize it, theorize it, and contextualize it in depth. Thus, it has been developed from the content of semi-structured individual interviews and focus groups with these educators of primary and secondary education. As analysis procedure has been used the content analysis technique, which aims to give voice to the sayings, unspoken and silences of the participants.

Regarding their transformations, educators reported about their challenges working with an innovative pedagogic (P.C.: “you will have many taboos, you will have several difficulties, you will have many problems adapting and even breaking paradigms...”) but also achievements (PL: “I left my comfort zone, which gave me new life, that feeling of the beginning of the career, when the spell was present in every new experience”).

They also related about their role in the teaching-learning development process (P.N.: “because in *Autonomy*, there wasn’t a major figure, authoritarian, who owned all the knowledge. What existed was a mediator, which also learned...”), and their professional maturity (P.E.: “the experience I won, today I’m another professional, and I have another view about education. Before that, I was a teacher just to be a teacher...”), (P.N.: “I think before *Autonomy* I was a teacher, now I’m an educator...”).

So, it can be concluded, according to the research purpose, that yes, there has been transformations in professional teaching practices of educators who use of *Telessala™ Methodology* in *Autonomy* Programme.

**Keywords:** *Telessala™ Methodology, Autonomy Programme, Professional Teaching Practices, Transformation, Pedagogic Innovations.*

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## 1. Introduction

The motivation to write about this subject came up during the years I worked as an educational consultant at Roberto Marinho Foundation (FRM) in public policies to accelerate the studies for grade correction, to youth and adults students in discrepancy between age and grade of Brazilian public schools, that use the *Telessala Methodology™*, in partnership with cities and state governments, among them the *Autonomy Programme* from the Education Department of Rio de Janeiro State (SEEDUC).

In 2008, according to the National Institute of Educational Studies and Research Anísio Teixeira (INEP) data, the Rio de Janeiro State presented an age and grade distortion rate of 36.2% for primary and 49.1% for secondary schooling. The results of the Basic Education Development Index (IDEB) indicated that the State of Rio de Janeiro occupied the 26th position in the national ranking, with high rates of

failure and evasion. In order to resolve the situation, the *Autonomy Programme* was implemented through the Resolution / SEEDUC No. 4,295 of June 4, 2009. By 2014, the age and grade distortion rate had fallen to 32.7% in primary and 31.8% in secondary schooling, and Rio de Janeiro State had climbed to the 4th place in the IDEB ranking.

As mentioned, the *Telessala Methodology*<sup>TM</sup> has as theoretical and methodological assumptions a conception of education as a practice of freedom / autonomy / citizenship based on the ideas from Paulo Freire; a theory of learning and knowledge based on the concepts of complexity from Edgar Morin, of competence from Philippe Perrenoud and of constructivism from Lev Vygotsky; a conception of transformative, libertarian, procedural, diagnostic and formative evaluation, and of the teaching and learning process where the teacher is trained to assume the role of a pedagogic mediator.

For writing the thesis, I also use, among others, the *Telessala Methodology*<sup>TM</sup> from Vilma Guimarães; the UNESCO Four Pillars of Education by Jacques Delors; the question of the teacher as a qualified interlocutor from Ariana Cosme; the tensions and the pedagogical point from Phillipe Meirieu; the Paradigm of Communication from Rui Trindade; manuals about qualitative research in education and case study as João Amado, Jose Carlos Morgado and Robert E. Stake; and content analysis from Laurence Bardin.

## 2. The *Telessala Methodology*<sup>TM</sup>

The *Telessala Methodology*<sup>TM</sup> has as its Central Theme “An Education for the Development of Being”, worked along four modules, during two years of project, each one corresponding to a group of subjects and a Thematic Axis: “The Human Being and its Expression. Who am I?”; “The Human Being Interacting with the Space. Where am I?”; “The Human Being in Action. Where am I going?” and “The Human Being and his Social Participation. What is my mission in the world?”.

Jacques Delors in “Educação: um tesouro a descobrir” (1999) suggests that the pedagogical practice should be concerned with the developing of four fundamental learnings: learn how to know, learn how to do, learn how to live and learn how to be. Are four the UNESCO Pillars of Education and three the foundations of the *Telessala Methodology*<sup>TM</sup>: the four Teams that the students are divided - Socialization, Coordination, Synthesis and Evaluation -, the Memorial and the Reading of Image.

The Reading of Image is an exercise in reading the world in the same logic as the “Culture Circles” from Paulo Freire. Freire (2009) in “A importância do ato de ler” deepens: “the reading of the word is not only preceded by the reading of the world but by a certain form of ‘writing’ it or ‘rewriting’ it, what it means, to transform it through our conscious practice” (Freire, 2009, p. 20). In the *Telessala Methodology*<sup>TM</sup>, a fundamental importance is given to image texts, such as the Teleaulas.

The Memorial, rather than an instrument of a write practice, is an instrument for reflection about the teacher didactic discourse and the academic history of the student. The Memorial is not an agenda of the day, it is a logbook, where teacher and student report their life and pedagogical experiences. And it is also, therefore, an instrument of student empowerment, that finds itself the author of its own history.

In practice, the *Telessala Methodology*<sup>TM</sup> works according to a dynamic: the first daily pedagogical step is the Welcome Activity, that can be realized by the Socialization and Coordination Teams; after that is the Questioning, the Teleaula exhibition, the Reading of Image, the Reading and Activities with the Textbook, the Complementary Activities, the Socialization of Activities and the Evaluation of the Day, which may be writing in the Memorial or realized by the Synthesis and Evaluation Teams.

Therefore, these educators go through a week of training at each beginning of the module, where they dialogue with the other teachers of the project about their challenges and achievements, working on the theoretical and methodological foundations of the pedagogical proposal and the collective planning. A pedagogical accompaniment is also realized, through technical and pedagogical meetings and visits to the classrooms, strengthening the dynamics of the classroom and the theoretical and methodological assumptions, encouraging the achievements, seeking collective solutions to overcome the challenges and observing the participation, interaction and integration of the students and the educator.

### 2.1. The teacher at Telessala

The educator at *Telessala Methodology*<sup>TM</sup> presents itself as a pedagogic mediator, what does not imply the weakening of its training in the content of curricular subjects, but the strengthening of its capacity to promote interconnection between the different disciplines. Therefore, the teacher at Telessala is not a specialist in its disciplinary area, but multidisciplinary. Roberto Crema (1993), in “Além das disciplinas: reflexões sobre a transdisciplinaridade geral” clarifies: “The transdisciplinary approach is not against specialization and recognizes its need and importance. What is postulated is the opening of the specialist to the whole that surrounds him” (Crema, 1993: p. 140).

This promotion of interdisciplinarity and transdisciplinarity is based on the concepts of complexity and pertinent knowledge developed by Edgar Morin (2000), that in “Os sete saberes necessários à educação do futuro” argues: “These systems cause a disjunction between humanities and sciences, as well as the separation of the sciences into highly specialized disciplines (...), making each time more difficult its contextualization” (Morin, 2000: pp. 44-45).

About the conception of education as a practice of freedom / autonomy / citizenship, in “Pedagogia da Autonomia: saberes necessários à prática educativa”, Paulo Freire (2009) affirmed that “teaching is not to transfer knowledge but to create possibilities for its production or its construction” (Freire, 2009: p. 22); and rejected the teacher and student dichotomy, that use to separate the responsibilities in the construction of the knowledge, proposing instead a collaborative sharing construction. “There is no teaching without learning, these two explained themselves and their subjects (...), do not reduce themselves to the condition of an object, one of the other. Who teach learn when teaching and who learn teach when learning” (Freire, 2009: 23).

Phillipe Meirieu (2005), in “O cotidiano da escola e da sala de aula: o fazer e o compreender” comments about the “pedagogical tensions”, the first one about the “postulate of educability”, according to “no one can teach without postulate that the other, before him, is educable” (Meirieu 2005: 74). Everyone is capable to learn, but for this need to “imagine new methods that can minimize the failure and combat all forms of fatality” (Meirieu 2005: 75).

Once again, Freire (1967), in “Education as a Practice of Freedom”, insisted on overcoming the naïve and empty aspect of our education, that imposed to the man the mutism and the accommodation, and the disbelief in the student, in his power to discuss his own problems, because he believed in a democratic education, and in its ability to take responsibility for its own decisions. Madalena Freire (2010) in “Educator, educa a dor” criticizes: “We were disciplined, as students, to listen, attending class. (...) A good student does not come inside questioning, asking in the educator's class. Its entrance is by the quietness of the listener” (Freire, M, 2010: p.149).

Ariana Cosme (2009), in “Ser professor: a ação docente como uma ação qualificada”, about the tension that exists between the protagonism of the teachers and the students, analyses the first of Phillipe Perrenoud (2001) dilemmas, “Around the word and the silence”: “It confronts the impossibility of the teacher 'have the privilege of imposing the silence and breaking it, of saying who should speak and who should be quiet, when and why' and, simultaneously, expect that the students participate actively in the daily life of the classroom” (Cosme, 2009: pp. 66-67).

In order to facilitate the debate, the *Telessala Methodology<sup>TM</sup>* proposes the space organization with the seats in a circle. In this space, educator and students change their places, and when they are not in the conversation circle suggested by Madalena Freire, they form small groups to discuss the new knowledge acquired. “In every classroom that uses this methodology, we find people with different knowledge, organized in a circle, dialoguing, with the mediation of an educator or a motivated educator and prepared to use various pedagogical methods” (Guimarães, 2013: p. 9).

### 3. Objectives

Thus, in addition to understand and analyse the transformations of teacher's professional practices of educators who used the *Telessala Methodology<sup>TM</sup>* in the *Autonomy Programme* in Rio de Janeiro State between 2009 and 2014, the objectives of this research are also to understand and analyse how these educators seem themselves today as professionals and human beings, from the changes that the use of this practice brought to its role of organizers in the teaching and learning process; what changes that from the use of this didactical pedagogical resource occurred in the affirmation and transformation of the teaching and personal identity of these professionals; and to reflect about the application possibilities of this didactic methodology in other educational contexts.

The latter specific object leads to my original question, the starting point for the search: - Assuming that the *Telessala Methodology<sup>TM</sup>* transformed the pedagogical practices of teachers who worked in the *Autonomy Programme* in Rio de Janeiro State between 2009 and 2014, which contributions this change can offer to improve teaching practices inside or outside the classroom, in regular schools or other educational settings and thus to the quantitative (reduction of failure and evasion) and qualitative (teaching and learning) improvement of basic education?

### 4. Methods

This research is based on a methodological approach of a qualitative nature since it understood that this rationality is the most adequate for a work that is mainly about understanding and interpreting a singular and complex reality. Robert E. Stake (2012) in “A arte da investigação com estudos de caso”,

about the differences between qualitative and quantitative research, affirm that they lie in the objective of understanding and not explaining - as if there were logical causes and consequences which could give rise to statistics - the object of investigation.

The option for case studies appears because it is a question of deepening a specific object of study and it is necessary to describe it in detail, to conceptualize it, to theorize it, and to contextualize it to interpret this change in depth, in order to renew perspectives and discover new problems. José Carlos Morgado (2012) in “O estudo de caso na investigação em educação” describes four characteristics of a case study: it is a *holistic study*, takes into account the complexity of the context; *empirical*, subject to the data collection through instruments and techniques; *interpretative*, is not intended to be impartial as a quantitative research; and *empathic*, takes into account the voices of the actors involved.

Thus, the research has been developed based on the content analysis of semi-structured individual interviews and focus groups with primary and secondary schooling educators from public schools in the Capital, Baixada Litorânea, Região Serrana and Noroeste of Rio de Janeiro State. Representatives of the FRM and SEEDUC are also being interviewed. In order to triangulate this information, quantitative data were also collected from INEP, the Official Diary of Rio de Janeiro State, the SEEDUC webpage, and the External Evaluation of Egresses and Active Teachers of Telecurso<sup>R</sup>: 2013/2014, contracted by FRM.

The richness of this strategy is to allow the surface the unique experiences of these educators, because the objective is not to get answers of *yes* or *no*, *what* and *how much*, but *how* and *why*. About group interview, João Amado (2013) in “Manual de investigação qualitativa em educação” underline that “the interviewer has to be interested in the group and about what is experienced by the group. It is not the private universe that counts, but the collective specific meanings of the group” (Amado, 2013: p. 224).

As a procedure of analysis, the technique of content analysis has been used, whose purpose is to give voice to the “spoken”, to “not spoken” and to the silences of the investigated, conferring to them the status of co-authors of the text, what requires from the researcher's attitudinal skills such as listening, and ethics such as being honest in transcribing the lines and keeping the participants identity confidential. Laurence Bardin (1995) in “Análise de Conteúdo” concludes: “This attitude of ‘critical vigilance’ requires methodological surrounding and the use of ‘rupture techniques’ is more useful for the specialist in human sciences, as more he has an impression of familiarity with his object of analysis” (Bardin, 1995: 28).

## 5. Discussion

Regarding the challenges that these educators faced when using the *Telessala Methodology<sup>TM</sup>* in the *Autonomy Programme*, a teacher reported that this leads to a confrontation of taboos and a breaking of paradigms during the adaptation phase (PC: “you will have many taboos, you will have several difficulties, you will have many problems adapting and even breaking paradigms”). Regarding the achievements, an educator commented about the professional maturity, which changed their view about the role of the teacher in education (PE: “the experience I won, today I’m another professional, and I have another view about education. Before that, I was a teacher just to be a teacher, I came to this conclusion, maybe for immaturity. I thought I become very mature with this experience”).

Regarding the challenges faced by educators in working with multidisciplinary, a teacher reported that during the graduation the teacher assimilates the importance of the specialization and becomes a defender of a fragmented knowledge, (PL: “the teacher assimilates throughout his / her graduation the importance of specialization, which ends up making us defenders of a fragmented knowledge, with little connection with other disciplines, especially when these, in our view, have little affinity with ours”). Regarding the conquests, an educator commented that with the multidisciplinary, the specialist teacher becomes more complete in terms of general knowledge (P. C: “multidisciplinary gives you the opportunity to become a person, I will not say more cult, but more complete, of information, and even more able to pass this information on”).

Regarding the transformations in the professional teaching practices, an educators reported that, since their role was mediators of the teaching and learning process, they learned together with the students (PN: “because inside one, one Autonomy, there was no such main figure, authoritarian, that owned all the knowledge. What existed there was a mediator, which also learned”). And about the affirmation and the transformation of personal and teaching identity, an educator reported on the ability to renew themselves because when we have been doing the same things for a long time we use to accommodate ourselves (PL: “So, having to study and learn, I left my comfort zone, which gave me new life, that feeling of the beginning of the career, when the spell was present in every new experience”).

Regarding the possibility of applying this didactic in other educational contexts, two educators commented that teachers, even tired, felt insecure about updates themselves (PE: “because the teacher even already tired, is afraid of innovations, today I am in the middle of a situation seeing both sides, I can

already make one, a preview. I see them very afraid to change, unsure...), but that the *Telessala Methodology*<sup>TM</sup> is a way to update school ( PN: “but what I really like was that anyone who had contact with this Methodology studied it in depth, because this could be a way to update school, do you understand? This could be an alternative and, I want to highlight, it have a strong connection with Paulo Freire...”).

## 6. Conclusions

From the content analysis of the semistructured individual interviews to the teachers, it is possible to conclude, according to the research objectives: yes, there were transformations of the professional teaching practices of educators who used the *Telessala Methodology*<sup>TM</sup> in the *Autonomy Programme* between 2009 and 2014.

Regarding the changes that the use of this practice brought to its role as organizers of the teaching and learning process, we noticed that there were taboos and paradigm breaks when they became mediators and no longer the only holders of a scientific knowledge; that they learned from the students, from a new teacher and student relationship, no longer authoritarian, but democratic. Regarding the changes that occurred in the use of this didactic and pedagogical resource in the affirmation and in the transformation of the teaching and personal identity of these professionals, we find that there was a rescue of the dream, of the ideal present at the beginning of the teaching career; an enhance of the role of teacher to educator; and, after years of regular schooling, an exit from the “comfort zone” that brought a new encouragement to these educators.

And with regard to the possibilities of applying this didactic methodology in other educational contexts, we conclude that yes, it is possible, but it is necessary to guarantee teachers training and pedagogical accompaniment to progress from the paradigm of the nineteenth century instruction, beyond the paradigm of learning, whose center is no longer the teacher but the student, for the paradigm of communication, according to Rui Trindade (2010), whose third vertex of the triangle proposed by Houssaye is the cultural patrimony, what approaches Paulo Freire’s ideas that no one educates anyone; no one educates himself, we all learn in communion.

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## **OUTDOOR LEARNING IN THE CZECH REPUBLIC – CONFRONTATION BETWEEN PLANS AND REALITY**

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### **Abstract**

Curricular system in – Czechia is formed on two levels. State level is represented by National Education Development Programme and Framework Educational Programmes (FEP). The FEPs are created for individual fields of education and define the compulsory contents, scope and conditions of education for its individual stages. The implementation of the state curriculum at the school level is represented by the School Education Programmes (SEPs). SEPs stand for educational autonomy of schools as well as teachers' professional responsibility for the outcomes of the educational process. The point of SEP lies in motivating teachers to elaborate on their own ideas (including outdoor learning) regarding education in the schools where they teach at.

The aim of this paper is to confront the SEP content analysis of selected primary schools and the views of teachers in relation to the outdoor learning as a powerful teaching strategy. SEP content analysis was performed using quantitative methods on a sample of 50 schools in Czechia. The particular anchoring of various forms of outdoor learning in the SEP was analysed in terms of time, space, subjects taught, a complex concept, etc. The identified data have been verified by qualitative methods – semi-structured interviews with teachers at 10 schools from the sample. The results of the interviews should also extend the analysis of other data that are not detectable by analysis of documents – e.g. positives and negatives of outdoor learning from the perspective of teachers, barriers to implementation, or of the assessment of this form of teaching. It was also examined whether the outdoor learning at the school is implemented as a comprehensive concept – whether the forms of outdoor learning are continually developed in higher grades in terms of knowledge and skills.

Results of confrontation show that SEPs are generally formal documents that each school further elaborated in annual thematic plans. These plans give a clearer idea of what the schools in terms of outdoor learning realise, including specification of forms and hours. Furthermore, it is shown that the teacher – according to his experience and courage to implement outdoor learning – has a major influence on the intensity and implemented forms of outdoor learning. As the largest barrier to the realization seems to be the financial aspect, good communication with parents and school management is essential. Therefore, further research is focused on evaluating individual forms of outdoor learning from the perspective of parents and pupils.

**Keywords:** *Czech Republic, outdoor learning, School Education Programme, primary school.*

### **1. Introduction**

Outdoor learning (in other words also outdoor learning) is a form of education which is considered to be a strong educational strategy to understand nowadays in our world for years, cf. e.g. Lambert, Balderstone (2000) or Oost et al. (2011). It is distinctive for many natural and social scientific disciplines. It is essential and indispensable for Geographical and Biological education. Outdoor learning is very specific and not only is it beneficial to a cognitive field, but also for the affective side of education and simultaneously, interpersonal relationships and mutual communication are supported as well. Various kinds of skills connected with useful outdoor activities are acquired by pupils and it also permeates through the whole curriculum of the elementary and high school. Despite the sufficiently described benefits of the outdoor learning (Ernest, Monroe 2004, Rickinson et al. 2004) and required consolidation in the current school curriculum, its realizations in lessons on all levels and types of Czech schools encounter many obstacles.

### **2. Objectives and Methods**

It would be a vain effort to search and research the outdoor learning in Czechia. There is no awareness of including the outdoor learning to SEPs and of the actual implementation in the primary and high schools. It is only partly touched in the case study of Knecht and Hofmann (2013).

Therefore, the aim of the following paper is:

1) To analyse and consolidate the outdoor learning in the chosen SEPs in the lower and upper primary schools

2) To compare results of content analysis of the SEPs to results of guided interviews with teachers, i.e. to find out real putting into practice of the outdoor learning in the primary schools.

The working hypothesis stated to mentioned aims is the following: *“In the primary schools, the outdoor learning is held non-conceptually and the individual forms of the outdoor learning do not follow and not complement each other.”*

For a purpose of fulfilling the first aim, the content analysis of 50 School Educational Programmes (SEPs) of model schools was made – complete primary schools (lower and upper primary schools) or lower eight years grammar schools in the South Moravian Region and the South Bohemia Region. The analysis primarily focused on checking, whether any kind of outdoor learning is realised in the schools, whether and how the outdoor learning is mentioned in the curriculum and the teaching plans. The evaluated parameters were chosen due to content, temporal, localization and organizational points of view. The assessment of data onto closed and semi-closed questions (in more details e.g. Hay 2010) was done through standard mathematical and statistical methods, and for open questions through keyword analysis of the mentioned texts. It is necessary to say, that the open questions are evaluated through the subjective evaluation of the author.

Subsequently, the content analysis was verified and complemented by guided interviews with primary school teachers from 10 schools, where the content analysis of SEP was done and was found that the outdoor learning is performed. The aim of the interview was e.g. to find out what forms of the field work teachers realised, what the support of the school management is, or how they prepare for the outdoor learning, and so on.

### **3. Outdoor learning in Czech Education Programmes**

#### **3.1. Theoretical ground of outdoor learning in Frame Educational Programme**

The outdoor learning is already included in the Czech educational system within FEP for the lower primary schools, especially in the educational area “Human and his world”, where the basics of the natural and social sciences are laid. It is highly recommended using the places, where pupils go to school and live.

The outdoor learning is firmly embodied in the individual educational areas in the Framework Educational Programme for Primary Education (FEP PE) for the upper primary schools, and for --- grammar schools (FEP G). Particular thematic units referring directly to the outdoor learning is consolidated in the FEP PE in the educational area “Human and Nature” for two subjects – Geography (Geographical outdoor learning Practice and Applications) and Biology (Practical Learning about Nature). The expected outcomes with the outdoor learning in the FEP G are contained for Geography in the thematic area “Geographical information and outdoor learning”. On the contrary, the outdoor learning in Biology is not mentioned in any thematic area nor expected results.

The outdoor learning may be widely used within Physical Education and Health Education. There are activities as e.g. staying in nature, camping, summer and winter training exercises, etc. within the Physical education. Knowledge and skills from various subjects are consciously or automatically used during all these activities, e.g. map orientation, protection against adverse weather conditions, etc. Activities connected with safe behaviour during physical activities in an unknown environment and so on, are taught in grammar schools.

A new Educational Act places teachers of the Czech primary and high schools into a new situation – to transfer Framework Educational Programme into a level of School Educational Programme. Rigorous utilization of cross-curricular links and integration of individual subjects are one of the preferences of the FEP. The outdoor learning, that is an integral part of many subjects, is an appropriate teaching method fulfilment of inter-subject links; it leads to cooperation and collaboration of teachers from different educational areas. It only depends on teachers in relation to the outdoor learning, in what way they convert all teaching activities into SEP.

Great space for the outdoor learning is during short and long term activities, e.g. during education in nature. It can be therefore stated, that there is all assumptions to apply the outdoor learning due to the Czech Educational curriculum. Though, the outdoor learning is included mainly on the basis of the historical point of view of the system and it is not supported nor justified by any research and its form is likewise historical, hence outdated in most of the schools.

#### **3.2. Outdoor learning in School Educational Programmes – Results of Content Analysis**

The outdoor learning was somehow mentioned in all 50 analysed SEPs. The degree of representation of the outdoor learning in SEP was then assessed subjectively. It is included a lot in the 12 (24 %) SEPs (It is mentioned within more subjects and there are named other activities as – outdoor

training course, ecological stay, projects connected with outdoor stay, etc.), medium in the 18 (36 %) SEPs and not much in 20 (40 %) SEPs (The outdoor learning in whatever form is mentioned very seldom.).

It is important for the coordination of the outdoor learning and for the creation of its system, whether the outdoor learning in the SEP is presented as an integrated concept. i.e. whether the individual forms of teaching in the given subject fit together and fluently develop, and whether there are inter subject links or a comprehensive system of long-term forms of the outdoor learning. The analysis shows, that the reality is different in --- most of the researched schools. The field work is not presented as the comprehensive in the 40 (80 %) cases; it seems comprehensive in only 9 cases, and the comprehensiveness is not possible to analyse in one case. A coordinator of the outdoor learning was not identified within any school (Hofmann, Trávníček, Soják; British outdoor council 2015), in a similar way there are coordinators of Environment Education at schools.

Analogical ratios of answers were shown also in the following question inquiring whether the outdoor learning is mentioned in the part of SEP called “learning plan”. Mention of the outdoor learning in the learning plan was only in 13 (26 %) cases, whereas it was not mentioned in 36 cases (72 %). The part “learning plan” was not even identified in one case. It is much more mentioned in the part of SEP called “Learning curriculum”. The field work is mentioned in 49 cases of 50, it was not identified in one case.

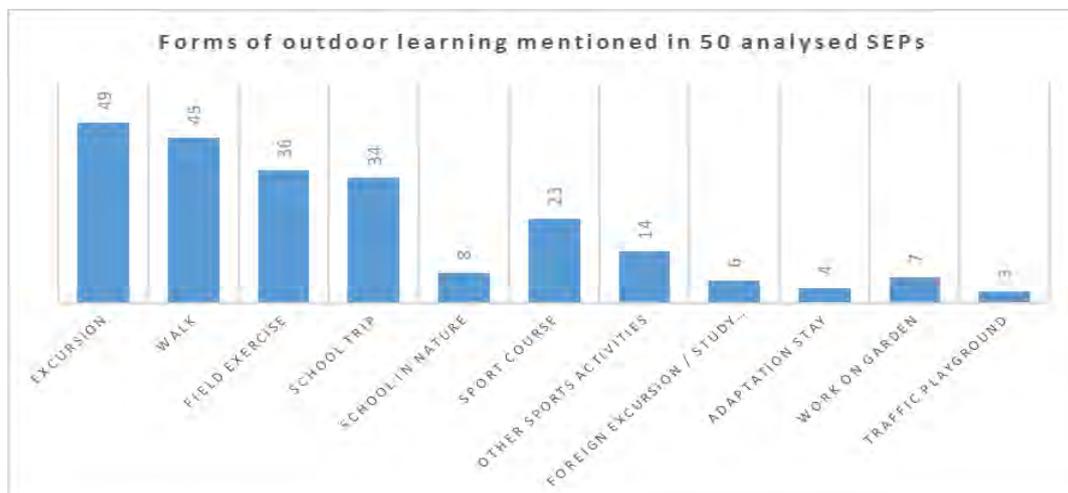
From the viewpoint of space, the outdoor learning in the SEP is mostly conceived as an education in the surroundings of the village, where the school is situated. As a place for the outdoor learning the countryside – landscape and also school grounds were chosen in 32 cases. It was impossible to exactly pinpoint the place for the outdoor learning in 10 cases. If other places, where the schools hold the outdoor learnings, were identified, these places were indicated as another possibility.

In terms of time, short outdoor learning, which lasts 1–2 lessons, was mostly identified in the analysed SEPs – in 35 cases. Those may be working on school grounds, or visits of exhibitions and museums, and so on. The long-term outdoor learning, lasting 2 days and more, was identified in 35 cases. Those are mostly sport courses, trips or stays in educational/environmental centres. The median term outdoor learning, lasting one school day, is mentioned the least frequently in 24 cases. It is therefore evident that nearly half of the surveyed schools realise all forms of the outdoor learning in terms of time. And also the fact, that it is very difficult to use one school day just for one subject or for integration of subjects in the long term learning blocks as shows the smallest representation of the medium term forms of the outdoor learning. It was not possible to identify the duration of the outdoor learning in 16 cases, because the time allocation is not mentioned in many SEPs and it is necessary to guess it on the base of the specific activity, which may last due to different organization for many hours or days, e.g. in the case of projects.

Inclusion of the outdoor learning from the subject viewpoint confirms the previous assumption of integration of subjects. The subject’s and integrated form of the outdoor learning were identified together in SEPs in 29 cases. However, the outdoor learning included in the individual subjects was mentioned only in 20 cases. The integrated outdoor learning was mentioned only in one case.

The outdoor learning appears in different forms of the analysed SEPs. There is no standardized designation for those forms. Every school calls individual forms according to its customs. Some identical designation of forms of the outdoor learning can be identified from analysed SEPs, or some forms are found which are similar according to its designation and thus probably close to its content.

Figure 1. Forms outdoor learning identified in the SEP 50 model schools (Source: authors).



#### 4. Outdoor learning in school reality by view of teachers

It is evident from the interviews with the teachers, that some teachers understand the integrated concept of the outdoor learning, which is mentioned in the SEP or in a plan of Environmental education, where annual events of the school are mentioned. Though, other forms of the outdoor learning (especially the short term ones) according to analysis of SEPs, carried out within projects in SEP, are not usually given. This suggests a fact, that even though some teachers claimed that they have the integrated concept of the outdoor learning at school, it is not completely true. The annual (week) curriculum or a statement of a subject committee is considered to be the integrated concept in some cases.

All interviewed teachers of the lower and upper primary school stated that they have certain technique for choosing topics for the outdoor learning. The teachers of both degrees stated in the vast majority, that the topics of the outdoor learning are bounded with the current curriculums that are embodied in the SEP or in the thematic plan (8 times for the lower primary school, 8 times for the upper one.). A specific topic of the outdoor learning surely depends on teaching specialization of the teacher and his personal preferences (*“everyone prefers what is close to his own heart”*) and *“an offer”* of the region (regional customs and traditions, environmental topics).

Most of the schools, where the interviews were held, don't have an expressed amount of lessons of each form of the outdoor learnings for lessons in the thematic plan. 7 teachers of 9, in the upper primary, and 6 of 10 teachers, in the lower primary, had a negative response. It is possible to assume from the different responses that the hours, or rather daily time allowance for long term outdoor learnings, which annually repeats, are assessed. During the specific query on hours allowance for outdoor learnings, one of the teachers stated that: *“there is noted a week, a week departure.”*

From the mentioned forms, walks, excursions, trips, scientific and national history activities in the field (orientation in the landscape, in the map, to plot and easy plan or a draft) or exercises in the nature appeared in this question for the lower primary schools. Schools are also commonly involved in educational programmes with the collaboration of external entities. (Leisure centre, city, fire-fighters, etc.) Lower primary teachers are in advance to upper primary teachers, because they teach all subjects, so they can join them together. Activities in the field may mingle with other subjects.

Upper primary teachers stated as realized forms of the outdoor learning, e.g. projects, go for a walk during a geography lesson (to determine the azimuth, work with a map integrated with IT), in history, e.g. visit of museums, regional walks (caves – prehistory, a church, a charnel house or a valley of the Křtiny brook), in natural history it can be to collect insect in the garden or creating a herbarium (educational excursion – collecting of leaves, observing animals, bugs, etc.). And they can also visit LTC centres, hospitals, first aid courses, collecting and analysing rocks during a marching exercise. It was also noted e.g. taking a photo while ICT or the connection with physics while skiing or boating.

One of the questioned stated, that it is not possible to realise any form of the outdoor learning during language lessons due to a lack of time. Another one argued, that it is possible, e.g. during a regional walk in a foreign language. *“Well, I would not do much in Russian, because they are beginners... I am happy if they learn to read or to write... within two years...”* This suppressed e.g. teaching language through CLIC.

6 of 9 teachers of the lower primary schools and all 10 teachers of the upper primary schools feel some restriction for preparing and realisation of the outdoor learning. The restrictions don't seem so serious in the lower primary schools – unwillingness to finance the outdoor learning by some parents, eventually by underprivileged families, is mentioned as an example. The next reasons are to provide safety of pupils, which needs assistance from a second teacher for the regular classes, weather, or unwillingness of the pupils to go out depending on their declining physical condition (*“A modern handicap”*). Higher demands (not awarded) on preparation and some time limits are also mentioned. There was also a mention of the absence of outdoor learning classrooms.

Course allowance is the crucial barrier in the upper primary school. It is necessary for teachers to be able to move together with pupils during the short term outdoor learnings lasting 45 minutes. If the teacher wants more than a 45 minute lesson, he must join lessons, which is demanding on communication with other teachers and they should exchange lessons. The next important problem is administration connected with realisation of the outdoor learning. Barring to provide safety of pupils, which need assistance from a second teacher, the consent of parents is necessary. One of the teachers pointed out, that if he wants to be out for more lessons, he must arrange for exchange of supervision during breaks. In case of a whole day or more days form of the outdoor learning, lessons of other subjects are cancelled. Furthermore, lessons taught in the field are not recognized as taught (!) Thus the teacher must substitute for free. And even if the teacher comes back with the pupils in the late evening or it lasts for many days.

## 5. Conclusion

Outdoor learning is a powerful educational strategy in today's world. Pupils acquire or strengthen by this form of education which is not divorced from reality, all the competences listed in the FEP PE – competence to learning; competence to solve problems; communication competence, social and personnel competence, civic competence; working competence.

Each teacher has to implant elements of outdoor learning into SEP by itself. Content analysis of 50 SEPs revealed that all schools have outdoor learning in certain manner enshrined in SEP. However, structured interviews with teachers in model schools have revealed that the implementation of outdoor learning can be a problem for a number of schools and teachers.

The vast majority of schools performs outdoor learning without clear conception, especially in its short forms. Long-term forms are represented by established, annually recurring events, such as visits to the ZOO or Planetarium etc. Nevertheless, this cannot be regarded as a problem-oriented outdoor learning that would lead students to critical thinking and develop competence of learning. Next research should reveal which forms of outdoor learning develop students' competences and their attitudes to teaching. On this base the optimal conception of outdoor learning should be proposed.

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## GAMIFICATION IN LEARNING CHINESE: USING KAHOOT TO MOTIVATE NON-CHINESE SPEAKING HIGH SCHOOL STUDENTS

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### Abstract

“Gamification”, the integration of gaming elements, mechanics, and frameworks into non-game situations and scenarios as described by Fotaris, Mastoras, and Leinfellner & Rosunally in 2016, is often used in the classroom to motivate and engage students in learning. However, despite the rapidly growing number of American students learning Mandarin Chinese – American president Barack Obama has committed to having one million students learning Mandarin by 2020 – and the known difficulties that Westerners schooled in alphabetic, non-tonal languages have in learning the tonal, non-alphabetic Chinese language, few studies have been done to date on using gamification in teaching Chinese as a second language. One popular example of a game-based learning platform is “Kahoot”, and a number of researchers (e.g., Olatoye, 2015) have found that Kahoot can effectively engage students in learning and enhance students’ motivation to learn.

This study examined the effects of Kahoot in enhancing high school students’ learning motivation in Chinese language instruction. Subjects were 18 students in a private female high school in the Midwestern United States. All were enrolled in a Chinese language class that met every day for 45 minutes. An identical pre-survey/post-survey design was used in this study for data collection. The main section of the survey includes two scales: “Beliefs about Chinese Learning” and “Confidence in Ability to Learn Chinese”. The beliefs about Chinese learning scale is a short version of the “Student Beliefs about Chinese Learning” scale developed by Yu-Ju Lan (2014) and consists of 17 Likert-type questions on a five-point response scale (1 = strongly disagree, 5 = strongly agree). The “Confidence in Ability to Learn Chinese” scale was adapted from a self-efficacy for foreign language learning instrument developed by the National Foreign Language Resource Center (2000). It consists of 20 questions, with 5 in each of the following four areas: reading, listening, speaking, and vocabulary. It uses a scale that ranges from 0 (not sure at all) to 100 (completely sure).

Paired t-tests were conducted to examine whether there were significant differences in student beliefs about and confidence in ability to learn Chinese as a foreign language. The results indicate that there was no significant difference in student beliefs,  $t(16) = .476$ ,  $p = .64$ . Among the four areas of confidence in ability to learn Chinese (reading, listening, speaking, and vocabulary), we found significant differences with regard to reading,  $t(16) = 2.63$ ,  $p < .05$ , and speaking,  $t(16) = 3.633$ ,  $p < .01$ . There was no difference in student confidence in the areas of listening,  $t(16) = 1.427$ ,  $p = .173$ , or vocabulary,  $t(16) = .364$ ,  $p = .721$ . This study found that the use of Kahoot improved students’ confidence in their ability to learn to read and speak Chinese, though not confidence in their ability to learn to accurately hear spoken Chinese or master Chinese vocabulary.

**Keywords:** *Kahoot, gamification, Chinese learning, motivation, engagement.*

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### 1. Introduction

In recent years more and more K-12 schools in the United States have initiated Chinese language programs. For example, there are approximately 8,000 students studying Mandarin in Chicago’s public schools (Shao, 2015), and as of March 2015, there are more than 550 schools in the U.S. had set up Chinese programs, a 100% increase since 2013 (Shao, 2015). In September 2015 America President Obama committed to have one million students learning Mandarin in next 5 years (Feldscher, 2015).

However, learning Chinese is very complicated for American students accustomed to an alphabetic, non-tonal language. This creates an additional challenge when trying to motivate students in the classroom. In addition, current students have grown up in a digital world, using the Internet and

personal electronic devices regularly and often playing video games on a daily basis; they can be relatively unforgiving of traditional instructional activities that rely on paper and physical textbooks.

Given this concern, diligent educators seek alternative teaching methods to enhance students' learning in the classroom. Recently, a variety of technologies have been integrated to facilitate Chinese language teaching and learning in many effective and efficient avenues (Zhan & Cheng, 2014). While student motivation is only one of multiple concerns being addressed, it is an important component, and gamification (that is, the integration of gaming elements, mechanics, and frameworks into non-game situations and scenarios) has proven to be one effective approach to address student motivation.

For example, one study used mobile game-based learning in the secondary classroom to engage and motivate students' learning in a history class. A quasi-experimental design was used with 458 students from 20 classes in 5 schools. The students in 10 of the classes played a mobile history game whereas the students in the other 10 classes received a regular, project-based lesson series. The results showed the students who played the game to be engaged and to gain significantly more knowledge about medieval Amsterdam than those students who received regular project based instruction (Huizenga, Admiraal, Akkerman & ten Dam, 2009).

Fotaris, Mastoras, Leinfeller & Rosunally (2016) conducted a study using "Kahoot", a game-based Classroom Response System that can be used in both traditional and online learning environments, and noted that students could use Kahoot to formatively self-assess their learning in a fun and engaging way. Previously, Olatoye (2015) had indicated that Kahoot could effectively engage students in learning, enhance students' motivation to learn, and also engage students effectively by timing student responses and awarding points based on their speed and accuracy. Through Kahoot, teachers can examine students' strengths and weaknesses; thus it can help teachers to differentiate their teachings to meet students' needs.

What is Kahoot? Kahoot (<https://getkahoot.com/>) was launched in 2013 in Norway, and is now used by over 50 million people in 180 countries. It is a free game-based learning platform that allows users to create, play and share learning games for all ages in any subjects. It allows teachers to create and/or post questions online and to assess students' understandings of learning content based on students' responses and the ways in which they explain answers to their teachers' questions. As Kahoot may be played using any device, desktop or laptop with a web browser, it is rapidly gaining attraction in classes with "bring your own device" policies.

Most of the studies that have been conducted on the effectiveness of Kahoot in engaging students have taken place using subjects other than Chinese. There has been no direct research on the effectiveness of Kahoot with non-native speakers learning Chinese. Can Kahoot be used to increase student motivation, or otherwise positively affect the attitudes, of student in an American classroom learning Chinese? There are two specific problems here. The first is the question of whether or not significant content relevant to learning Chinese can be incorporated within Kahoot – after all, this is a question of using employing a tonal language via a non-Western character set within software written and implemented in Norway. The second is the question of whether or not the "game" aspects of Kahoot will directly affect the motivation and attitudes of American students learning Chinese in the same ways it has positively affected motivation and attitudes in other subject areas. This study aims to address these questions.

## 2. Design

Kahoot was implemented for 15 minutes in a 45-minute Chinese class that met daily for one semester. Kahoot was used to provide practice for students in a gamified environment in the areas of reading, listening, and speaking Chinese, as well as Chinese vocabulary.

Identical pre and post surveys were used in this study for data collection. One dealt with beliefs about learning Chinese, and the other dealt with students' confidence in their ability to learn different aspects of the Chinese language.

## 3. Objectives

The purpose of the study was to investigate whether use of the game-based platform "Kahoot" would either change non-Chinese-speaking students' beliefs about learning Chinese, or affect their level of personal confidence in their ability to learn certain aspects of Chinese. The research question is: To what extent are students' beliefs about learning Chinese, or their confidence in their ability to learn Chinese, affected by the regular use of Kahoot in their Chinese class?

## 4. Methods

### 4.1. Participants

The sample subjects in the study were eighteen female students in a private female high school in the Midwestern United States. Eight were in the ninth grade and ten were in the tenth grade. They were enrolled in an optional Chinese language class taught by one of the co-authors of this article skilled in the use of Kahoot for Chinese language instruction. The Chinese language class met every day for 45 minutes. Fifteen of the students were Caucasian, two were Asian (Vietnamese), and one was Hispanic.

All subjects completed pre- and post-surveys administered by the Chinese language teacher.

### 4.2. Procedures

One of the co-authors of this article has substantial experience in the use of Kahoot. Kahoot is a free learning game program that can be installed on any computer device with a Web browser. While using Kahoot, teachers can create “Kahoots” – that is, sets of multiple choice questions and quizzes. When a Kahoot is launched in the classroom, the multiple choice questions will be shown on the classroom screen (e.g., on a Smart Board or computer projection screen) in a timed manner. Students log into the Kahoot on their individual devices (computers, tablets, or smartphones) and see the same questions being displayed on the classroom screen. As the timed questions are presented, students are asked to enter their answers as quickly as possible. For every question answered correctly, students will (individually) earn points and view their current scores and rankings in real time. Students can participate in the Kahoot either individually or as a team. When a quiz is over, the students or student teams with the highest scores are displayed on the screen.

The Chinese class used in this study met daily for 45 minutes, and all participants completed a pre-survey before the beginning of the semester and a post-survey at the end of the semester. The Chinese language teacher administered the surveys after explaining the procedures and provided clarifications when students had questions about specific survey items. Parental consent forms were distributed in class and students were asked to take it home and bring it back in a week.

In our study, Kahoot was used daily in the Chinese class for one semester. The Chinese language teacher would develop a Kahoot in advance and launch it in the classroom 15 minutes prior to the end of the class. After a brief review of the contents that have been covered, the game would begin with questions shown on the screen one after another. Students would compete to answer the questions using their mobile devices (usually smart phones). When the quiz was over, names of the five top players would be displayed on the screen. The teacher would congratulate the five students and give them a small gift. The whole class would then throw a little celebration to conclude the class.

### 4.3. Instruments

Identical pre and post surveys were used in this study for data collection. Each survey consisted of a demographic section with questions about the student’s grade level, age, gender, ethnicity, primary language at home, level of Chinese study, and amount of time spent on Chinese learning. The main section of the survey included two scales: beliefs about Chinese learning and confidence in ability to learn Chinese. The beliefs about Chinese learning scale is a short version of a Student Beliefs about Chinese Learning scale developed by Lan (2014) and consists of 17 Likert-type questions on a five-point response scale (1 = strongly disagree, 5 = strongly agree). Sample questions are “I find great pleasure in learning Chinese” and “Chinese will make me more competitive in the job market”. The Confidence in Ability to Learn Chinese scale was adapted from a self-efficacy for foreign language learning instrument developed by the National Foreign Language Resource Center (2000). It consists of 20 questions, 5 in each of the following four areas: reading, listening, speaking, and vocabulary. It uses a scale that ranges from 0 (not sure at all) to 100 (completely sure), students would rate how sure they are of their ability to complete a specific Chinese learning task such as figuring out the main topic/gist of a passage read in Chinese or retelling in English what they read when reading a text in Chinese.

### 4.4. Results

One student was removed from the data analysis because this student appeared to be careless when filling out the surveys by entering 0s in a random way. Thus results were based on seventeen of the original eighteen students.

Table 1 indicates the means and standard deviations of student outcomes before and after intervention.

Paired *t*-tests were conducted to examine whether there were significant differences in student beliefs about and confidence in ability to learn Chinese as a foreign language. The results indicate that there was no significant difference in student beliefs,  $t(16) = .476$ ,  $p = .64$ . Among the four areas of

confidence in ability to learn Chinese, we found significant differences in confidence in ability to learn reading Chinese,  $t(16) = 2.63, p < .05$ ; and in confidence in ability to learn speaking Chinese,  $t(16) = 3.633, p < .01$ . There was no difference in confidence in ability to learn Chinese listening,  $t(16) = 1.427, p = .173$ , or Chinese vocabulary,  $t(16) = .364, p = .721$ .

*Table 1. Means and Standard Deviations of Student Outcomes Before and After Intervention.*

| Variables             | Pre-intervention |       | Post-intervention |       |
|-----------------------|------------------|-------|-------------------|-------|
|                       | Mean             | SD    | Mean              | SD    |
| Beliefs               | 3.94             | .59   | 3.90              | .64   |
| Reading Confidence    | 59.88            | 18.17 | 69.18             | 12.94 |
| Listening Confidence  | 51.76            | 19.05 | 57.41             | 18.40 |
| Speaking Confidence   | 50.71            | 17.73 | 61.29             | 15.64 |
| Vocabulary Confidence | 69.41            | 13.26 | 70.24             | 12.90 |

## 5. Discussion

The use of Kahoot in their Chinese class had no significant effect on the beliefs about learning Chinese held by the subjects in this sample. This may be because most of the questions in that particular instrument dealt with the potential consequences in the outside world of learning Chinese. The ways in which Kahoot was used in this study did not address that topic; classroom activities were specific to language content and skills rather than the connection of these skills to events outside the classroom.

The second instrument used in this study measured students' confidence in their own ability to master specific aspects of using the Chinese language: reading, listening, speaking, and vocabulary. While there were no significant changes in student confidence in their ability to learn Chinese listening or Chinese vocabulary, there were significant increases in students' confidence in their ability to learn to read Chinese, and their ability to speak Chinese. The authors are not entirely sure how to account for these effects. Reading Chinese as a second language seems to be the easiest of the four areas, and it may be that a semester's exposure to learning activities with Kahoot was sufficient to convince students that reading Chinese characters was an entirely learnable skill. The questions in the instrument that dealt with speaking Chinese dealt primarily with the ability to make oneself understood in a Chinese immersion setting and did not focus on master of spoken Chinese with a high level of precision, and it may be that after a semester students felt that this "rough and ready" level of competence was within their grasp. This combination of effects could explain the two areas of significance in the data. The other two areas were not significance – confidence in one's ability to understand spoken Chinese, and Chinese vocabulary. Understanding spoken Chinese is clearly the hardest of the skills, and it may be that one semester of work with Kahoot was not sufficient to inspire confidence in students that they could master this skill. The items on the survey instrument that deal with Chinese vocabulary were split between written and heard vocabulary, and it may be that the "listening to Chinese" component in this mix was enough to cancel out any confidence in learning Chinese vocabulary inspired by a feeling of confidence in written Chinese.

## 6. Conclusions

Gamification is a popular approach to motivating students in a wide variety of classes at all levels. The program known as Kahoot is one popular, free example of tools used to gamify lessons. In this particular case, it proved to be motivational for one sample of students beginning to learn Mandarin Chinese as a second language, and may have had positive effects on their confidence in learning certain aspects of the language.

This particular exploratory study lacked a control group, a follow-up study incorporating a control group that did not use Kahoot would allow one to separate out the effects on student confidence of simply spending a semester studying a new language. One might also approach this issue by combining an element of qualitative methodology with the current research methods. Generalizing from this small, all-female sample is problematic, so the authors also recommend additional research with a larger sample incorporating both male and female students.

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## **DIGITAL LEARNING SOLUTIONS: ARE WE DESIGNING ASSESSMENT FOR LEARNING?**

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### **Abstract**

Increased class sizes in Higher Education has coincided with increased use of technology and particularly in large classes the use of technology-supported assessment is commonplace. Often the key driver is efficiency. This paper reports on the range of assessment choices made by staff when assessing large classes and the pedagogic rationale behind those choices.

Assessment is resource heavy in the modern higher education institution, however, poor experiences of assessment and lack of early feedback is often associated with poor learning experiences, failure and dissatisfied students particularly for first and second year undergraduates. Evidence suggests that some disciplines have an over reliance on Multiple Choice Questions (MCQs) as summative assessment which we know, from published literature on the subject, can lead to a poor student learning experience. By examining MCQs and other forms of technology-supported assessment, we will build a framework of appropriate assessment tools used for assessing (both formative and summative) specific learning outcomes.

Assessment for learning rather than assessment of learning is Tenet 1 of the HEA research study.

*“A high quality learning process requires a balance between formative and summative assessment ensuring that summative assessment does not dominate.”* (“A Marked Improvement”, 2012)

Innovative use of learning technologies can help achieve a high quality learning process; effective assessment has greater bearing on successful learning than almost any other factor. Students and staff can work in partnership to explore the range of different technologies that could be used in assessment activities. Technology can transform the assessment and feedback lifecycle by returning and recording marks and providing feedback much quicker than by doing it manually; this alone has benefits to both students and staff. Assessment for learning rather than assessment of learning can be part of this transformation. (Salmon, 2011).

In this study we will focus on large classes (>150 students) across a number of disciplines, examining the range of technologies harnessed in the assessment process. We will examine the variety of pedagogic approaches employed when assessing module/programme outcomes using technology in parallel with the student learning associated with those chosen tasks.

**Keywords:** *Assessment, large class-size, pedagogy, technology.*

### **1. Introduction**

As a prerequisite to our current research we examined the use of technology and online software tools and their associated teaching approaches in the disciplines of Computer Science, Medicine and Law, all notorious for having particularly large class sizes. We asked teaching staff in the above disciplines to complete a short survey consisting of questions designed to draw on their experiences and reveal the measures they have employed when teaching to a class whose numbers exceed 150 students.

It was revealed that the technology and software tools teachers used could be grouped into three areas.

1. Organisational and Administrative technologies in the form of software tools which generally act as time saving devices helping with assessment, feedback, mark distribution and uploading and downloading course resources.

2. “Lecture-friendly” technology and software tools which simulate a small group setting to encourage active learning and student engagement and reduce anonymity within the lecture theatre.

3. Connection technology and software tools including social media tools which help students avail of resources, collaborate with peers, connect with teaching support staff and participate in group discussions both in class and outside of class.

Table 1. The three groups of software tools used.

| Group 1   | Group 2                                  | Group 3         |
|---|--|-----------------|
| Grademark   | Socrative                                | Socrative       |
| Moodle-peer assessment  | Camtasia                                 | Kahoot          |
| Moodle quiz   | Prezi                                    | Moodle forums   |
| Developed own software which automates semi-personal feedback | Echo 360                                 | Post it plus    |
| Turnitin  | Turning Point (audience Response System) | Twitter         |
| Questionmark  | SoftChalk                                | Facebook        |
| VLE online tests  | Group work using clickers in lectures    | Blackboard chat |
| Online scripted purpose written mark forms                    | EVS-PollEverywhere                       | Peerwise        |
|   | Quizz mechanisms                         | Padlet          |

From the above results in table 1 we can clearly see that the tools used which belong in Group 2 and Group 3 were chosen first and foremost with teaching pedagogies in mind to help address the negatives associated with being one student in a very large class. (Cusco, 2007) It is recognised by research carried out that a student can feel lost and can remain anonymous in a large group setting. (Cusco, 2007) But introducing the use of software tools such as Socrative and Personal Response System (PRS) technology allows students to participate and collaborate in the lecture theatre and with their teacher. (Martyn, 2007)

PollEverywhere can help create a small group setting which encourages students to engage. (Bonwell & Eison, 1991) The software tools and technology such as peerWise and Blackboard Chat which belong in grouping 3 permits students to connect with peers and their teacher through blogs and chat forums. (Denny, Hamer, Luxton-Reilly & Purchase, 2008)

But the software tools chosen which belong in Group 1 address efficiency and scalable processing of large student numbers but do not profess to be pedagogic.

Although there is some overlap in all three groups, these findings encouraged further investigation of the teaching rationale behind methods of assessment chosen and their connection if any to enhancing teaching and learning.

It is for this reason that the methods of online assessment will be investigated further in this study. Our objective is to examine the assessment process and its significance as a pedagogy.

We will examine the variety of pedagogic approaches employed which use technology to assess module and programme outcomes in parallel with the student learning associated with it. (Biggs & Tang, 2011)

## 2. Methods

We surveyed 22 university lecturers from schools in Science, Technology, Engineering, Maths and Medical Science who typically have large class sizes. The data collected would reflect the consideration given to pedagogy and the approach to learning outcomes in both summative and formative assessment of their modules. Also, data would be collected which would record the online tools and applications currently in use. See below the seven questions:

Q1 Do you find that your students have a positive/negative attitude to online assessment?

Q2 What are your aims when you choose online summative assessment?

Q3 What format does this take?

Q4 Are you confident that online summative assessment maps the module learning outcomes sufficiently well?

Q5 Do you use MCQ for summative assessment purposes beyond 1st year?

Q6 What are your aims when you choose online formative assessment (please rank in order)?

Q7 Do you use any free software/web sites for formative assessment/student support?

## 3. Results

Analysis of the results obtained from survey are as follows:

Q1 Do you find that your students have a positive/negative attitude to online assessment?

Positive attitude 81.82%

Q2 What are your aims when you choose online summative assessment?

Help in managing huge numbers 45.45%

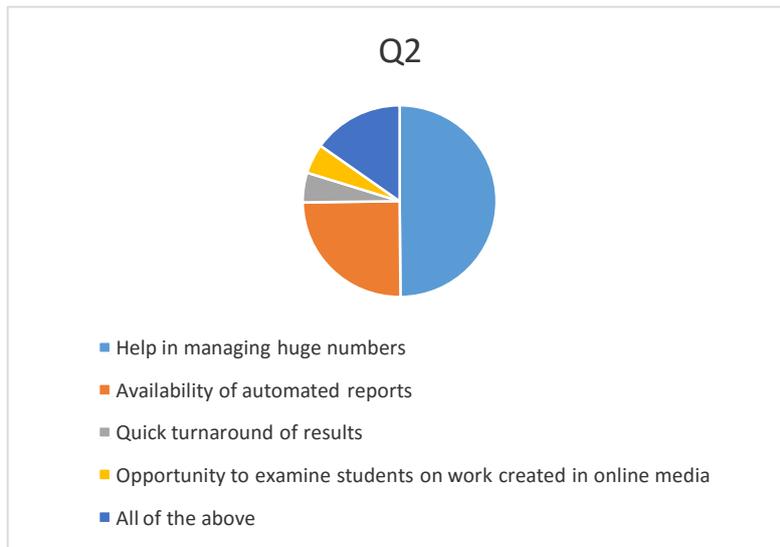
Availability of automated reports 22.73%

Quick turnaround of results 4.55%

Opportunity to examine students on work created in online media 4.55%

All of the above 13.87%

Figure 1. Q2.



Q3 What format does this take?

QuestionMark type questions 45.45%

MCQ 13.64%

5% E-portfolio

5% Group/collaborative work

And the remaining approximate 30% a mixture of Online projects (blogs, online presentation), VLE submission- assignment, own designed system, Numbas/Moodle and a combination of both E-portfolio & MCQs

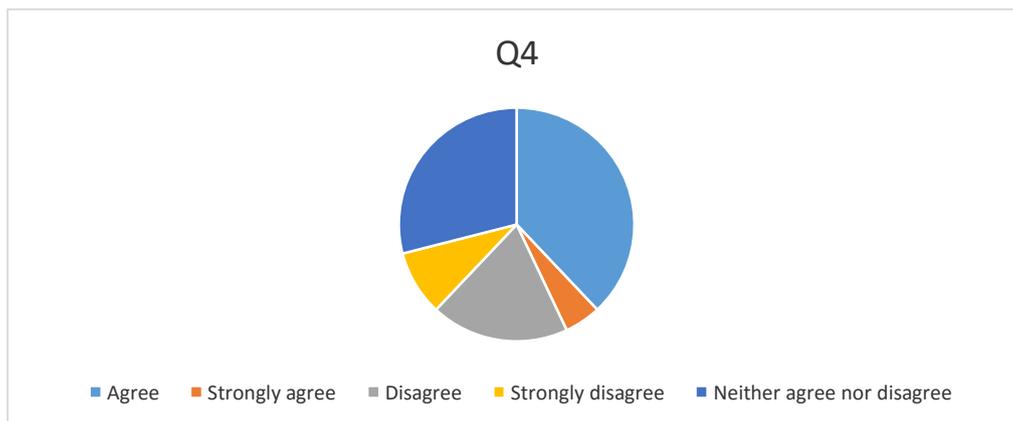
Q4 Are you confident that online summative options assess the module learning outcomes sufficiently well?

Agree 38.10% with 5% strongly agree

And 19% disagree with 9% strongly disagree

29% neither agree nor disagree

Figure 2. Q4.



Q5 Do you use MCQ for summative assessment purposes beyond 1st year?

Yes 36.84% because..

“of large numbers of students”

“Efficient - and large numbers throughout the pathway.”

“As part of a mixed assessment method” “Good way to assess basic understanding and application of knowledge, supplements coursework and end of year exams.”

“of the high numbers, it is the least evil”

No 63.16% because..

“I don’t-I focus on projects by way of structuring/encouraging learning”

“My assessment involves more creativity, longer answers”

- “No. worries re technical failure, poor Wifi”  
“They are not appropriate for assessment in my subject at UG although they can be a useful learning tool”  
“It doesn't meet all the learning outcomes”  
“It doesn't fit with the content of my modules”  
“MCQ is not adequate in mathematics”  
Q6 What are your aims when you choose online formative assessment (please rank in order)  
4.50 “To improve learning through student engagement and collaboration”  
3.38 “To both obtain feedback on my teaching and provide student feedback in a timely manner.”  
3.33 “To facilitate frequent ongoing assessment so that students focus on progress”  
3.20 “To move focus away from achieving grades and on to learning processes”  
1.92 “To facilitate frequent ongoing assessment so that instructions can be fine-tuned”  
Q7 Do you use any free software/web sites for formative assessment/student support?  
A wide range of software tools are in use  
PRS  
Survey Monkey  
Doodlepoll  
Numbas, Kahoot  
Foxit  
Peerwise  
Peermark  
PollEverywhere  
DoodlePoll  
Numbas, Kahoot  
“I don't use any software. So far I found them to either not fit with the content of my modules or as demanding a huge amount of time from the lecturer “

#### 4. Discussion

Teaching staff had a very clear understanding of what their aims were when they designed formative assessments. (Nicol & MacFarlane-Dick, 2004). An overwhelming score of 4.50 was returned for the statement, “To improve learning through student engagement and collaboration”. Following closely behind were the following two aims, “To both obtain feedback on my teaching and provide student feedback in a timely manner”, “To facilitate frequent ongoing assessment so that students focus on progress” and last but not least by any significant different was, “To move focus away from achieving grades and on to learning processes”.

This was encouraging feedback.

Our discussion leads us to examine how summative assessment is being weighted in significance as a pedagogy in its own right worthy of positive influence in a student's learning experience. When asked what their aims were when choosing online summative assessment, 45.45% of teaching staff answered, “Help in managing huge numbers”.

Students have a positive attitude to online assessment; it was considered that over 80% of students would confirm this statement. Today's students are of the millennial era and in many regards are of a generation who are most comfortable with technology as their means of assessment. (Rivera & Huertas, 2008)

Students have a positive approach to online assessment. How would we rate teachers' attitude to online assessment methods? What was most evident from the responses in the survey to Q2 was that a teacher's first and foremost consideration when choosing a summative assessment method is the help it provides them with in managing numbers, producing reports and supporting fast turnaround of results.

But when probed further, the teachers were not convinced themselves or were convincing that they were assessing for learning. Only 43% agreed they were and 28% admitted they definitely were not, and a further 29% did not commit themselves to agree if they did or did not. Therefore, we could conclude that 57% of teaching staff could not confirm that their online assessment designs had learning outcomes in mind or were addressing them when they chose an assessment method.

This attitude is in contrast to teachers' response to use of MCQ for summative purposes. (Palmer & Devitt, 2007)

From the responses in Q5, teachers seem keenly aware of the benefits and limitations of MCQs, of when it is appropriate to use them and when it is not. If they find that they are using them inappropriately they are willing to admit it and reveal why.

“Efficient-and large numbers throughout the pathway” and “of the high numbers, it is the least evil”.

Only 5% surveyed used E-portfolio and only 5% used group/collaborative work when summative assessing, even though this type of assessing is promoted widely when formatively assessing and has been recognised as a positive learning experience.

Having said that there is a significant number of teaching staff being creative and challenging themselves in their choice of summative assessment. Less than a third who responded in the survey are using online submission and online presentation assessments, a mixture of E-portfolio and MCQ and some have even designed their own system. Striving for improvement is obviously a key issue when summative assessment choices are made.

## 5. Conclusion

In conclusion, teachers are very focused on the pedagogic decisions they make when designing formative assessment and bring enthusiasm and much imagination in their pursuit of getting this right. (Gibbs, 2010)

Teachers have acquired awareness of their teaching methods when applying them to their assessments when considering using MCQ and have become inventive in their use, (Palmer & Devitt, 2007), but have yet to be more inventive and become more aware of pedagogies when using the many other online assessments tools available for summative assessments. For many, summative assessment is an administration process made more laborious linearly with the incremental increase of each enrolled student on a module.

It is an area which has presented many challenges to the conscientious teacher. It brings more challenges than any other area of assessment, as he/she endeavours to create assessments which assess learning outcomes efficiently and also is a positive learning experience for students.

## 6. Plan for Future Work

Collate information and produce guidelines on online summative assessment so that teachers would know when to choose a certain type of summative assessment and why.

Examine the correlation between learning and online assessments looking beyond staff perceptions of students' opinions but also enquiring of the students themselves.

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## LEARNING FROM VISIONS OF THE PAST FOR VISIONS OF THE FUTURE: SOME PEDAGOGICAL IMPLICATIONS

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### Abstract

Engineering Visions was launched as an Erasmus intensive programme in collaboration between five European universities interested in broadening the horizons of their engineering undergraduates beyond the hard-core approach typical of many undergraduate engineering degree courses. For this reason, a main focus was placed on the soft skills needed to complement specialist engineering skills. In each session, various teambuilding and methodological exercises prepare students for working in international multidisciplinary student teams, in which they analyse and evaluate challenges of the future and develop their own innovative solution or vision for their chosen scenario.

The present research aims at taking stock of the pedagogical approaches taken to date and the pedagogical outcomes perceived by participating faculty, with a view to learning from past experience and identifying areas for further improvement. A questionnaire was prepared and sent to faculty who had worked as presenters and/or mentors. Analysis of respondents' answers shows, for example, that there is a need to re-evaluate the balance of presenter input and student teamwork and that the role of the mentor needs to be clarified. Also, assessment and feedback procedures are in need of improvement. Generally, students are felt to have benefited greatly from methodology new to them and from the international experience in terms of intercultural awareness. Faculty themselves also much appreciated international teamwork. Furthermore, spin-off effects were noted and were considered extremely valuable. The questionnaire results were further evaluated with reference to relevant pedagogical research into soft skills acquisition and learning and communication in cross-border education.

**Keywords:** *Collaboration, visions, soft skills, international, multidisciplinary.*

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### 1. Introduction

The present research aims at taking stock of the pedagogical approaches taken to date and the pedagogical outcomes perceived by faculty participating in the Engineering Visions intensive programme (IP), with a view to learning from past experience and identifying areas for further improvement.

### 2. Background

The Engineering Visions IP was launched as an Erasmus intensive programme (IP) in 2013. This was a collaborative effort by five European universities interested in broadening the horizons of their engineering undergraduates beyond the hard-core approach typical of many undergraduate engineering degree courses. For this reason, the main focus of the IP was placed on the soft skills needed to complement specialist engineering skills (Löffler-Mang & Riehle, 2015). Students did some preparatory work at home before coming together for two weeks of intensive teamwork. First, a variety of teambuilding and methodological exercises prepared students for working together in international multidisciplinary student teams; these exercises included a variety of approaches for encouraging students to think outside the box and were flanked by a series of inspiring lectures. Students were then asked to analyse and evaluate future challenges and develop their own innovative solution or vision for their chosen scenario, with mentors challenging and supporting the teams as they developed their ideas.

The first two IPs were funded as Erasmus IPs in Germany and the Netherlands. When funding was discontinued under Erasmus+, the decision was taken to continue Engineering Visions as an IP summer school, with costs being split between the host university and the guest universities. In the meantime, two further IPs have taken place in Switzerland and Poland, with the fifth IP planned for

Sweden in 2017. What has become very apparent is the “local flavour” at each venue. There are clearly a number of reasons for this: differences in university culture, which may be compounded by national culture; the need for synergies at each location, which may relate to scheduling, costs, space and other constraints; the availability of faculty, staff and infrastructure. Thus, students in Germany defined their own challenge before working on a solution, students in the Netherlands worked on a task presented by an industrial partner, and students in Switzerland and Poland were introduced to Design Thinking methodology.

The IP in Sweden marks the end of a cycle of five IPs hosted once by each partner university. With the decision looming on whether to launch a second IP cycle, the present authors, who have been actively involved in the IP as presenters and mentors since the start, felt that there was a need for review. The views of a sample of students had already been collected in interviews at the end of the IP in Switzerland (Eriksson & Martin, 2016). Therefore, the purpose of the present research was to tap faculty views of the IP, ideally at two or more venues.

### 3. Methodology

A questionnaire was prepared and sent by email to a total of 26 faculty who had worked as presenters and/or mentors at one or more of the IPs, the present authors excluded. All in all, 12 faculty responded. Three respondents had only been mentors for the last IP in Poland; one respondent had been a mentor for the last two IPs; all other respondents had been mentors and/or presenters for three or four IPs. With two exceptions, those who did not respond to the questionnaire had only been involved once. A total of 11 questionnaires were returned, one respondent sent in some general comments.

It was decided to use a questionnaire rather than interviews due to the logistical problems of scheduling online sessions with faculty scattered throughout Europe. Also, the present research was considered a first step in evaluating faculty assessment of the programme, allowing for more detailed assessment if necessary at a later date. Qualitative data were collected using open-ended questions to allow faculty to present their views and add comments. The questions (Table 1) were divided into five sections and relate to issues considered important by the present authors as a basis for reflection and IP improvement.

The questionnaire answers were summarised in terms of the main issues addressed. We make no attempt to present a quantitative analysis of the answers given but focus on four categories for discussion purposes.

*Table 1. Sections and questions in the questionnaire.*

|   |
|---|
| <ol style="list-style-type: none"> <li>1. Please reflect on the overall development of the IP <ul style="list-style-type: none"> <li>• What do you regard as positive at each venue? Give reasons.</li> <li>• Where do you see room for improvement? Give reasons.</li> <li>• Any other comments</li> </ul> </li> <li>2. Please reflect on pedagogical aspects of the IP <ul style="list-style-type: none"> <li>• How do you rate the pedagogical concept(s) at each venue?</li> <li>• How do you assess the pedagogical outcome?</li> <li>• Any other comments</li> </ul> </li> <li>3. Please reflect on your pedagogic experience as an IP mentor and/or presenter <ul style="list-style-type: none"> <li>• How did you find your role as a mentor?</li> <li>• How did you find the task of assessing and grading the students work?</li> <li>• Any other comments</li> </ul> </li> <li>4. Please reflect on the pedagogic experience of working together with a group of international colleagues <ul style="list-style-type: none"> <li>• What were the positive aspects for you?</li> <li>• Did you meet with any problems? Explain.</li> <li>• Any other comments</li> </ul> </li> <li>5. Please reflect on the outcome of the IP and avenues for future collaboration <ul style="list-style-type: none"> <li>• How do you regard the outcome of each individual IP and the IP in general?</li> <li>• What do you see as future collaboration opportunities for the individuals and universities involved?</li> <li>• Any other comments</li> </ul> </li> </ol> |
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## 4. Results and discussion

In the following we summarise and discuss the main issues raised by our respondents and discuss possible implications.

### 4.1. Scheduling and pedagogical balance

The local flavour and uniqueness of each IP were highly praised by all respondents. However, respondents showed some concern about scheduling and pedagogical balance. Thus, for example, some faculty felt there was a need for more monitoring and guidance in the pre-IP phase than there is at present. With the introduction of Design Thinking methodology, some faculty were of the opinion that too much time was spent on input, leaving too little time for students to develop their projects. In 2016, a post-IP phase was introduced in Poland due to time constraints for the main IP phase, with student teams writing up their final report in the weeks following the IP. However, this idea of a post-IP phase was not acceptable to all. In terms of general scheduling, it was felt that overall planning was sometimes very late and that the IP should always be a standalone event, not combined with parallel events at the host university.

The different phases of the IP relate to workload. At present, 4 ECTS are awarded for completion of the programme. This workload calls for a pre- and/or post-IP phase in addition to two weeks at the host university. A pre-IP phase was planned for the original Erasmus IP. In the two most recent IPs, for example, students were required to complete a number of activities online, focusing on teambuilding and some preparatory work in the chosen field. However, introduction to, and guidance in, Design Thinking methodology during the IP itself meant that there was very limited time available for students to develop their ideas. One respondent felt that the whole procedure was too rigid, and there needed to be more freedom to allow students greater scope for creativity; another felt that project tasks too limited in scope were not conducive to encouraging students to be completely open-minded in their problem-solving approach. Given the international, multidisciplinary IP context, it is not clear what the best pedagogical balance for promoting creativity and visionary thinking might be. Future research might look at this more closely. Optimisation of the pre-IP phase with improved monitoring and guidance of students might be way to improve the balance between input and teamwork.

The workload could also be met by a post-IP phase. However, a number of respondents spoke out against this, without giving any specific reasons. One reason may be assessment: some respondents were in favour of the whole IP team discussing grades. Apart from possible logistical problems of scheduling an online conference for assessment purposes, some faculty specifically preferred face-to-face discussions to electronic exchange. Assessment issues are discussed in greater detail below. Another reason may concern timetabling at the different universities. Given that the timing of the IP will always call for a compromise on the part of the participating universities, whose lecture, exam and holiday periods do not coincide in any way, some faculty may prefer to end the IP on departure, both for themselves and their students. However, there will always be some universities faced with a pre-IP or post-IP phase running parallel to lectures or exams. Therefore, the question of a pre-IP or post-IP phase remains a matter for discussion and negotiation. With a variety of constraints affecting the different venues, it may be desirable that either option or a combination of options should always be possible. In this case, module descriptions need to allow for this and the host university needs to communicate at an early date how the IP will be run.

### 4.2. Role of the mentor

All respondents who completed the questionnaire were unclear about their role as mentor and felt there was a need for clarification. At present it is not clear whether the mentor should play a supervising or facilitating role. Specifically, the use of Design Thinking methodology posed problems for faculty not familiar with this approach. The suggestion was made that a description of the role and responsibilities of mentors should be sent out before the IP.

The IP mentors are all members of faculty nominated by their universities under the Erasmus or Swiss European Mobility Programme. Given that the IP has now been running for 4 years and is now into its fifth year, a hard core of mentors participate on a regular basis and the team is joined by new faculty members every year. Nevertheless, respondents reported being unsure of their role. This is perhaps not surprising as the mentors come from different disciplines, which may differ in approach, from different higher education institutions, which all have their own educational culture, and from different countries, which all have their own national culture. Thus, for example, some universities use a problem-based learning approach; others are accustomed to more traditional pedagogical approaches. Is there even consensus on what mentoring involves? Certainly in the literature, there are many varying views on this (Garvey, 2004; Garvey et al., 2014). Even without the wide range of backgrounds found in this

international, multidisciplinary team, mentoring and the role of mentor need to be defined. In addition, the fact that various methodological approaches have been taken is likely to call for various approaches to mentoring.

Thus, a description of the role and responsibilities of mentors would be helpful. Also, it would be a good idea to coach the mentors at the start of each IP. On the one hand, this would ensure there is no further uncertainty as to the role of the mentor and would offer support for faculty members who have not been in a mentoring role before. This was practised at the first IP, but has not been practised since.

### **4.3. Assessment and feedback**

Assessment was considered to be difficult due to the fact that each institution/country has its own grading system and perception of grading categories. Although some faculty would prefer a simple pass or fail, some institutions are required to give grades under their examination regulations. It was considered important that student performance should be discussed either with all colleagues, or with at least one colleague, at the end of the IP, possibly using words to describe grades such as excellent, good, sufficient, and insufficient. There was a perceived need for clear grading criteria, especially in terms of what constitutes a pass. A further problem mentioned by several faculty was the fact there was often little time for grading and giving students feedback on their work.

IP assessment is currently based on teamwork. Each student team gives a traditional presentation and a poster presentation, and writes a report for assessment purposes. At present, there is no clear description of what constitutes a pass or a fail. All faculty members have their own perception based on their own national system. There is generally a consensus, but in some cases there may be disagreement. In fact, one respondent even posed the question whether a student could fail. Based on our personal experience of the IP in Switzerland, it seems non-attendance could constitute a fail. However, the degree of non-attendance for a student to fail is not defined. Even more problematic is the process of setting grades according to the system of the host university, especially if these need to be translated into a different national grading system. The idea of using words to describe categories may be helpful to the assessors, but does not necessarily solve the problem of translating words into a grading system based on percentages. And it does not overcome the fact that some educational cultures tend to award top grades, whereas others do not. Thus, there is a need for clearly defined assessment standards and procedures in this international context.

A number of respondents felt that too little time was allocated for assessment and feedback purposes. Certainly, at the end of two very intensive weeks, little time remains for assessment. Here, too, there is a need for change. On the one hand, it might be argued that the amount of student output should be reduced; however, presentation and report-writing skills are very valuable as in the context of soft-skill development. Alternatively, it might be possible to stagger output so that there is less stress at the end of two weeks. For example, one presentation could be earlier and focus on work in progress. In the last IP, the report was written in a post-IP phase. In theory, this meant that each student team needed to be very well organised, which was an additional test of their soft skills; in practice, some teams had one student write the report, which was not the object of the exercise. Also, faculty did not find cross-border assessment and feedback easy.

In an intensive programme, assessment and feedback procedures will be close linked with scheduling. Given the fact that soft skills are an important IP learning outcome (see below), some thought also needs to be given to the assessment of a broader range of skills than at present. Peer assessment could offer some very beneficial feedback over a range of skills yet to be defined (Zhang, 2012).

### **4.4. Intercultural awareness and soft skills**

The most frequently mentioned positive aspect for both students and faculty was intercultural experience and awareness. By participating in the IP, students were “stepping out of their comfort zone” and successfully developed intercultural awareness in the course of intensive multidisciplinary, multicultural teamwork. Faculty praised student teamwork, motivation and creativity in a multicultural environment, in which both students and faculty “get to meet, learn and grow”. The overall consensus was that the objective of developing interpersonal and other soft skills was achieved. Specifically, learning together and learning from each other was very successful. The general atmosphere, student discipline and attitude to work was considered to be very good. Also, topics that often do not form part of mainstream engineering education, such as using English for communication or learning about poster presentations, were considered to be very beneficial. Spin-off effects of the IP were noted in the form of social networks, with students remaining friends and keeping in touch after the IP. Also, some students subsequently decided to take part in further mobility activities, such as an Erasmus exchange semester. Others were stimulated to think about career specialisms as a result of their tasks and visiting companies.

One respondent viewed international and multidisciplinary collaboration in the IP as being more important than the actual engineering visions of the students. It is true that today's graduates need soft skills in addition to their hard skills; they are considered essential for employability in our globalised world. In fact, it has been suggested that a generalist approach and soft skills are becoming even more important in terms of employability than hard skills (Nilsson, 2010). Although soft skills are often considered to be lacking in definition and fuzzy (Matteson, Anderson & Boyden, 2016), the IP learning outcomes included tools and techniques for “thinking outside the box”, effective cross-cultural communication and creativity (Löffler-Mang & Riehle, 2015). The respondents considered these objectives to have been met and also identified other important soft skills in the course of the IP, such as the development of interpersonal skills, team-working and positive work ethic. Research indicates that soft skills develop better as a result of acquisition and practice than through formal teaching (Dravid & Duncan, 2011), and the IP gave students the opportunity to acquire and practise a wide range of such skills. Nevertheless, given that soft skills are an important IP learning outcome, the complete set of soft skills to be developed needs to be defined and mapped onto assessment and clear assessment guidelines, as discussed above.

## 5. Conclusion

In the view of faculty, students benefited greatly from the methodology and the international experience and were successful in further developing their interpersonal and soft skills. Faculty members also very much appreciated the international teamwork. Positive spin-off effects included, for example, increased international student mobility following the IP. However, there is a perceived need to re-evaluate pedagogical balance, clarify the role of the mentor, and improve assessment and feedback procedures. We recommend that the IP organisers address these issues as soon as possible. There are also some areas that might benefit from further research: pedagogical balance, mentoring, soft skills assessment in the IP context.

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## **ARTS EDUCATION AND CULTURAL UNDERSTANDING: A PEDAGOGICAL FRAMEWORK**

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### **Abstract**

In this paper I reflect upon challenges of integrating arts education (dance, visual arts, and music) as core subjects in the United States and the viewpoint, held by some in the US, that arts are not fundamental and important to a democratic education in a global capitalist society. In this paper, I contest this opinion and offer a theoretical and pedagogical framework with which to view the value of the arts in a kindergarten through high school setting, ages 5 through 18. At the core of this framework is the theoretical idea that an arts education not only supports students development of arts specific skills, such as painting, acting, or dancing, but that inherent in arts education is an advancement of cultural understanding, mindfulness, and empathy that is advanced by creative and aesthetic study. This pedagogical framework outlines four objectives of arts education that are applicable to artistic teaching and learning globally, and has been developed through reflective teaching practices in partnership with analysis of established research. These objectives articulate the importance of students becoming more aware of multiple truths and perspectives, of building skills of negotiating and disagreement, advancing the ability to see and articulate difference with respect, and to increase an aesthetic awareness of diverse people, arts knowledge, and artistic perspective. In this paper, I also contribute practical approaches for arts classrooms that promote empathy and cultural understanding and are led by this new pedagogical framework. This framework for viewing arts education is essential for a world in which massive numbers of peoples are migrating, new leaders are making changes to policy and nation relationships, and in which the internet is bringing together people from varying cultures, backgrounds, and religions. To be able to communicate, respect difference, and negotiate with civility is essential in a world where borders are changing daily. This framework is presented in relationship to research in the field in the areas of arts education, mindfulness and empathy, cultural understanding, and pedagogy; Maxine Greene, John Dewey, Ken Robinson, and Brian Massumi.

**Keywords:** *Arts Education, Practice, Cultural Understanding, Pedagogy, Mindfulness.*

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## TEACHING CULTURAL COMPETENCE IN THE FOREIGN LANGUAGE CLASSROOM: MEETING THE OTHER

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### Abstract

Can we teach cultural competence in the foreign language classroom? How do we transmit cultural knowledge? Which cultural features do we introduce in a closed educational space? These are questions we aim to answer in this paper.

Anthropologist Lévi-Strauss sums up the concept of national culture and its rapport with other cultures in the following manner "A culture, he says, consists of a multiplicity of features some of which, to some degrees, are shared with closer or distant cultures, while other features can more or less separate them." This dichotomy is a common subject in the foreign language classroom when students are being taught "intercultural skills and know-how".

As a result from prior contacts with the target culture or from second hand knowledge of that culture, students may come to the classroom with biases and preconceived ideas. For example, students tend to believe that the language they are learning is classic and unchanged for centuries. Our object then is to deconstruct these ideas by showing students that no language, no art, no music, no architecture, no anthropological features of a nation are locked in a cultural bubble.

Our position then for the teaching of culture is aligned with recommendations suggested by the authors of the lengthy CEFR document (Common European Framework of Reference for Languages). In our presentation, we review the concepts of culturalism, interculturalism and multiculturalism; we present specific examples of differences and similarities between cultures; and we demonstrate how we can "promote mutual understanding and tolerance, respect for identities and cultural diversity through more effective international communication".

**Keywords:** *CEFR" Culture, Interculturalism, Multiculturalism.*

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## AN INNOVATIVE METHODOLOGICAL APPROACH BASED ON COLLABORATIVE LEARNING PROJECTS IN HIGHER EDUCATION

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### Abstract

Undoubtedly innovation is a key issue in higher education. With the aim of training successful professionals and enhance students' employability, universities invest money and efforts in researching on new methodological approaches. The picture of professors lecturing without the students' participation, no longer represents 21st-century universities. Nowadays, students are seen as the core of teaching/learning processes, hence issues such as collaborative learning, competence-based training, or problem-solving methodology have come on scene.

The experience we are presenting has been carried out at Florida Universitaria (private institution affiliated to the Universidad de Valencia, Spain). It is a workers' co-operative with long experience in education and training at different levels. The organization defines itself as dynamic and innovative having entrepreneurship as one of its leading values. Unavoidably, Florida's policy is projected on its educational proposal as we will show in this paper.

In 2010, Florida Universitaria went through an overall organizational restructuring which enabled this institution to go the extra mile and develop a holistic approach to training students in higher education. Interdisciplinary projects (IPs) performed in two educational levels (advanced vocational training and university degrees in the fields of education, business, tourism, ICT and engineering) have been the key instrument chosen to implement this methodology.

These interdisciplinary projects aim to improve students' professional competences by applying the problem-solving methodology in situations they are likely to face throughout their career. In addition, we guarantee that students graduate having had the opportunity to collaborate directly with local companies.

Each student will participate in a different IP per year; consequently, organizers have staggered the skills to be worked on throughout each degree or vocational training course. By the end of their studies participants will be trained in competences such as collaborative work, autonomy, entrepreneurship, ICT, oral and written communication, leadership, innovation, creativity, problem solving, cross-cultural awareness and internationalization.

Given the scope of this paper we will focus specifically on the role of collaborative work in the holistic approach developed at Florida Universitaria. Four groups of stakeholders are involved in this experience: management, lecturers, students and companies. The objectives of this study are twofold, first to show how an organization can manage an overall restructuring based on pedagogical goals and second to present two examples of interdisciplinary projects in two different levels, one implemented in the Degree in Tourism and the other in an Advanced Vocational Training Course in Administration and Finance.

**Keywords:** *Innovation, holistic, higher education, collaborative work, projects.*

### 1. Introduction

Challenged by the changes of the labour market in the 21<sup>st</sup> century, innovation has been a major issue for universities in the past decades. With the aim of training successful professionals and increasing students' employability, European universities have invested money and efforts in new methodological approaches as proposed in the Bologna Declaration in 1999, where the European Higher Education Area (EHEA) was established. Student-based teaching proposals have spread at undergraduate and postgraduate levels resulting in the enhancement of professional competences.

Not only Europe has experienced this change, also universities in other continents have modified their teaching methodology. For instance, Davidson et al. (2014) report that in many American universities over the last few decades, a large number of instructors have moved away from traditional

lectures to pedagogical proposals in which students are active participants in the learning process. However, in actual fact, getting universities to modify their traditional approach to teaching and learning is not easy, apart from obstacles such as priorities, cost structure or organizational issues, Kirschner (2012) highlights ‘inertia’ as one of the factors for resistance to change.

Hannan (2005) specifies that for innovation what higher-education institutions need is a ‘climate’ to encourage attempts to improve learning and teaching. This researcher emphasizes that technological development is not the only driving force of innovation. Hannan (2005) also enhances the importance of pedagogical concerns where the best of the old way of teaching is adapted to new requirements.

The experience we are presenting has been developed at Florida Universitaria in Valencia (a Spanish private institution affiliated to the University of Valencia). The particular features of this organization shape a suitable scenario for innovation challenges. Firstly, it is a young organization where the inertia has not become a major issue yet. After a few years of specialization in vocational training courses, in 1993, Florida Universitaria expanded its training offer to university education through its affiliation to the University of Valencia. Currently, courses offered by Florida Universitaria, including advanced vocational training, undergraduate and postgraduate studies, cover the fields of business, tourism, education, engineering and ICT. Secondly, Florida Universitaria is a small institution with 1,976 students what makes the organization flexible enough to adapt to new requirements. Finally, it is a private institution set up as a workers’ co-operative, which defines itself as dynamic and innovative, having entrepreneurship as one of its leading values. This guarantees an appropriate climate for implementing new methodologies.

Clearly Florida’s policy has influenced its educational proposal, and after a few years gaining experience with small-scale projects, in 2010 this university went through an overall organizational restructuring which enabled this institution to go the extra mile and develop a holistic training approach focused on problem-based learning (PBL). Currently at Florida Universitaria, PBL is the core methodology, as Bell (2010:39) puts it, ‘problem-based learning is not a supplementary activity to support learning. It is the basis of the curriculum’. Interdisciplinary projects (IPs) implemented in two educational levels (advanced vocational training and university degrees) are the key instrument chosen to introduce this methodology.

These interdisciplinary projects aim to improve students’ professional competences by applying the problem-based learning methodology since, as Bell (2010) claims, PBL teaches a multitude of strategies which are essential for success in the 21<sup>st</sup> century. There is no deny that ‘Learning responsibility, independence, and discipline are three outcomes of PBL’ (Bell, 2010:40).

IPs are annual projects carried out throughout the whole academic year. They are based on the solution of a problem related to situations students are likely to face in their careers and aim to link students with industry. We definitely support Arana (2010) when she suggests that a stronger bond must be formed between higher education institutions and companies, this connection can be achieved by the implementation of new programmes that make students think the way professionals do.

Each student participates in a different IP per academic year; consequently, coordinators have staggered the skills to be worked on throughout each degree or vocational training course. By the end of their studies participants are trained in professional competences highly valued by companies such as teamwork, autonomy, entrepreneurship, ICT, oral and written communication, leadership, innovation, creativity, problem solving, cross-cultural awareness and internationalization (according to reports such as EPyCE 2015 and Randstad Professionals 2016).

The objectives of this study are twofold, first to show how an organization can manage an overall restructuring based on pedagogical goals, and second to present two examples of interdisciplinary projects in two different levels, one implemented in the Degree in Tourism and the other in an Advanced Vocational Training Course in Administration and Finance.

## **2. Cooperation, the key to success**

Collaborative work in education has been praised by many scholars for its positive impact on students’ results. Among other benefits, it should be highlighted that cooperative work makes students learn more and learn from others, develops learners’ intellectual skills, increases group satisfaction and transmits positive values closer to social reality, on top of that it encourages entrepreneurship (Tejada & López, 2012; Cassany, 2009). Nevertheless, there are also some drawbacks for lecturers and learners, Palmer et al. (2003) list some: fear to lose control of their classes, lack of security in applying the methodology and finding this methodology too time consuming for the former and resistance to teamwork for the latter.

Despite advantages and disadvantages, IPs at Florida Universitaria are based on teamwork. In this institution, degrees and vocational training courses are still organized in subjects, following the higher education model in force in Spain. However, the interdisciplinary projects are the spine that gathers together those subjects around a professional problem based on real life settings. These IPs are carried out in all the years of each degree and vocational course. The magnitude of the endeavour makes collaborative work among all the stakeholders essential for successful outcomes. The four groups involved in this experience are: management, lecturers, students and companies.

There is a tight cooperation between management and lecturers, for instance, managers periodically meet with those teachers who act as IPs coordinators to outline the organizational needs and they come to terms with the extra expenses incurred as compared with traditional teaching. Additionally, the head of studies agrees with academic staff how to organize special timetables to fit a time slot to work on the IP apart from the time allowed in each subject. Moreover, the head of human resources arranges training courses for lecturers participating in the IPs to guarantee they are qualified to lead the new procedures.

Cooperation among lecturers is also of paramount importance, they have to share objectives, methodology, and organizational issues. The teacher who acts as an IP coordinator calls meetings as well as monitors content overlaps, coherence, and workload, so that the project is conveniently integrated in the course programme. Lecturers meet with the IP coordinator and all together decide the topic of the IP and the assessment system. Since an IP is not a subject itself but a product implemented by students with the participation of all the subjects in the curriculum, these subjects contribute time and activities to accomplish the desired outcome.

As far as cooperation among students is concerned, students work in teams of 4-6 members formed according to the results obtained after completing a Belbin test. Collaboration is opened to students in other courses, in fact, in the degrees, first-year students are coached by one final-year student per group who helps them organize. Instead, in vocational training courses, students from a different discipline contribute their expertise to accomplish the IP goals.

Collaboration between the university and companies is also decisive since IPs are based on solving problems found in real companies. Depending on the degree or vocational training course, companies participate as advisors, trainers or even as customers.

To facilitate communication among all the stakeholders, Florida Virtual Campus, blogs and social networks together with some free access resources are the tools used for sharing documents and communicating with other participants.

### **3. Two examples of Interdisciplinary Projects**

The different steps in the process of developing an IP are as follows: in parallel to the implementation of the project, students attend different training courses on professional competences to ensure they achieve quality outcomes. From September to May students work on the tasks assigned. At the end of the academic year, the final findings are summarized in a report and presented orally to a panel formed by the coordinator, lecturers, a member of the management and a representative of a company.

Students get a mark that will be part of the continuous assessment of each subject at the percentage agreed beforehand (25 per cent of the total result). Peer evaluation is also taken into account to calculate the final IP mark for its positive academic effect, as explained by Bell (2010:40) 'Accountability to peers often has greater consequences and provides more motivation for students than if they were only responsible to the teacher'.

Once the IP is finished, questionnaires to collect lecturers and students' opinions are distributed. Results are analysed by the project coordinator who shares the information with other stakeholders. Finally modifications are introduced to improve the outcomes in future editions.

In order to illustrate what IPs involve, the two examples chosen show how students work at two different levels. On the one hand, the IP carried out in the first-year of an Advanced Vocational Training in Finance course, which is based on a simulated situation. On the other hand the IP implemented by second-year students in the Tourism Degree that counts with the direct cooperation of a travel agency.

#### **3.1. Vocational Training: setting up a company**

With the experience gained in the past years and in an attempt to encourage students' creativity teachers opted for a more open IP proposal. Under the title of 'Which type of company do we want?' instructors posed a series of necessary questions to set up a business, keeping in mind the situation, the current social context and the administrative processes (commercial, accounting, financial, fiscal, human resources, ICT, communication and customer service). Several seminars related to innovation, creativity, teamwork, search of information, ICT as well as verbal and nonverbal communication were organized.

They provided students with the necessary competences to overcome their lack of specific business knowledge.

Once students had the questions, they ordered them in terms of priority to start the company. Then students identified in which course subjects they could find the information needed. After that, with the support of the corresponding teacher, groups started to work autonomously. Each question involves a series of tasks to be dealt with throughout the academic year, in some of them only finding information is required, whereas in others learners have to design a website and produce documents such as leaflets, business letters, etc.

To develop the project students have used TRELLO (a web based application that helps organize a project in boards). A coach was assigned to each group in order to follow up and control their daily work. The description of the company created must be summarized in a report.

At the end of the first year students get an overall picture of the structure and processes of a company. In their second year their IP will be focused on the application of the knowledge and competences acquired to the actual running of a company. To reach this, students will use a computing programme that makes dealing with providers, clients, etc. possible. In fact, they will actually negotiate online with other students from Spain or other countries who will act as simulated businesses (the application includes contact with more than 300 Spanish companies and other 7,000 in 42 countries).

### **3.2. Degree in Tourism: designing tourism products**

From September 2016, second and third-year Tourism students have been collaborating with a company to carry out the IP. Florida Universitaria signed an agreement of cooperation with Consultia Travel, a local travel agency, which offers a real professional scenario for our students. First of all, this travel agency provided students with specific training courses so that they could perform according to the company's standards. Then, second-year students were tasked with the development of tourism products to be evaluated by the agency in terms of viability, and if they meet the requirements set, these products will be added to the agency's catalogue and sold by third-year students who are running a branch of the travel agency based in Florida Universitaria.

For the purpose of this paper we are going to focus only on the second-year IP. During the first semester, students analysed the tourism resources available in the Valencia area and designed one-day trip per group for 90 Danish students who regularly travel in April each year to Valencia to attend lessons at Florida Universitaria. Students outlined their proposal in a report submitted to the coordinator at the end of the first semester, and created a webpage where the Danish students can find all the details of the day-trips proposed before they arrive in Valencia.

After participants have gained experience and know-how to design a longer tour, currently, in the second semester and in collaboration with Consultia travel, each group has been assigned the drawing up of a special-interest study trip to Spain for higher education students. First, participants have to research on university programmes to find out students' needs. Then, in order to gather direct information, teams are conducting an online survey among students of Florida's Erasmus partners. With the information obtained students will design four customized trips: for architecture students they will prepare a one-week trip to visit Arabian monuments in the south of Spain. For culinary arts students, the itinerary and activities will be based on the Basque Country. Leisure and Tourism students and hospitality undergraduates will be offered two programmes in Madrid. At the end of the academic year, these products will be presented orally to some representatives of the travel agency and a report with full details will be handed in.

Once the travel agency analyses the proposals and suggests adaptations if necessary, these tours will be available on their website so that any student worldwide can buy them.

## **4. Conclusions**

Experience shows that IPs must be in constant evolution to adapt to new needs, opportunities and satisfaction degrees. In fact, the two examples presented in this paper are the result of a gradual improvement of the projects performed in those levels in previous years. In the vocational training project, the approach has changed from more structured tasks to an open approach in which groups design the IP development planning and work at their own pace. In the case of the tourism degree, this academic year, students have faced real professional issues with the collaboration of a travel agency instead of working in simulated settings.

These changes have been projected on the results of the questionnaires completed by learners at the end of the first semester. Data show a positive trend in comparison with 2015-2016 ratings, namely there is a satisfaction increase of 28 per cent (Vocational Training in Finance) and 38 per cent (Degree in Tourism) in the items related to methodological objectives completion; furthermore, there is a rise of 24

per cent (Vocational Training in Finance) and 17 per cent (Degree in Tourism) in the number of students who regard themselves as satisfied with the IP whole process. Even though the results reported are slightly different depending on the educational level, it can nevertheless be asserted that perceived satisfaction values are highly positive in both, reaching a 9.0 (out of 10) in the vocational training course and 8.2 in the university degree.

These results offer crucial evidence for considering the PBL experience rewarding. Apart from the information obtained through questionnaires, the way participants perform in class determines that, by and large, the problem based learning methodology has a highly motivating impact on them. The fact remains that this method can only succeed if it is perfectly adapted to the participants' interests, academic level, teamwork experience and skills.

Needless to say that, the total commitment of the stakeholders is essential to accomplish the challenge posed by the interdisciplinary projects. Experience at Florida Universitaria shows that coordinating the participants is the hardest undertaking, a good IP coordinator is the cornerstone for a satisfactory outcome.

Florida Universitaria has incorporated PBL as methodological flagship, and has many resources at stake. However, students' proven achievement, in terms of competences acquired to perform satisfactorily in professional scenarios, encourages Florida Universitaria to continue enhancing this educational proposal. Our investigations tracing students' employability are still ongoing and seem to confirm the effectivity of our approach, although further data need to be gathered each year to prove the important professional implications of IPs.

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## **FLIPPED CLASSROOMS, FLIPPED HOMES? TENDING TO STUDENTS' PERSONAL COMPETENCIES**

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### **Abstract**

Technology and media use have dominated daily lives, have already had a profound impact on all aspects of parent-child-teacher interactions, and have increased workforce demands for significant computer skills. These changes have prompted shifts in pedagogical thought, a push for change in classroom practices, and an urgent need for tending to the learning needs of students in an ever-changing global landscape. In the era of personalized learning, technology use to enhance the individualization and differentiation aspects of learning is indispensable, and serves as the pillar of competency-based education. The swift pace of changes and the uncharted waters we have entered, however, have raised concerns and reluctance from practitioners and other stakeholders. When one though closely examines the opportunities that technology and media integration is offering, one realizes that the basic principles inherent in responsive, caring education have not changed. What has changed is modes of communication and instruction-delivery options. As with any and every innovation, its use is as good as its users. Technology is not a silver bullet, but it is as good as the educators who are utilizing it in a targeted and purposeful way to enhance student learning by putting an emphasis on the four personal competencies of the learner (cognitive, metacognitive, motivational, and social/emotional). The present paper explores ways students' personal competencies can be addressed within a flipped-classroom model, and the ramifications that such a model shift has on parent involvement and school-family interactions. Specifically, the flipped classroom framework is discussed as a context in which media integration can foster competence-based, personalized education; ways through which technology and media can be meaningfully integrated into instruction and homework are also presented.

**Keywords:** *Student competencies, flipped classrooms, technology integration, parent involvement, home-school interactions.*

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### **1. Introduction**

Technology and media have dominated daily lives having a profound impact on all aspects of parent-child, home-school, and student-teacher interactions (Patrikakou, 2015, 2016). The brisk pace of technology and media saturation has introduced a new variable that plays a progressively critical role in understanding child-parent-teacher relationships. The Pew Research Center (2015) reports that in the U.S. 97% of teenagers ages 12-17 and 96% of 18-29 year olds have internet access. OECD data indicate that over the past decade, percentages have increased sharply internationally as well. For example, in 2015 percentage of households with internet access via a personal computer within the European Union ranged from 68.1 (Greece) to 96.8 (Luxembourg), up from 21.7% and 64.6% respectively in 2005. However, with declining cost and easy access to cell phones and other hand-held devices, percentages to internet access can be even higher.

### **2. School-related use and students' personal competencies**

Called this generation's "Sputnik moment," access to technology and the internet are deemed essential for the countries to maintain or gain leadership among industrialized nations (Kohlenberger, 2007). This global technological leap has changed the way that families conduct their daily lives, connect with the community, and enhance their children's learning opportunities. Consequently, formal schooling in all levels of the educational ladder has been shifting. Especially, in the era of personalized learning,

technology use to enhance the individualization and differentiation aspects of learning is indispensable, and serves as the pillar of competency-based education.

Competence-based education extends beyond knowledge-transfer, and requires the learner to demonstrate targeted content and skills. This approach culminates into a higher order of learning that is assessed by a comprehensive student evaluation. Such an evaluation is embedded throughout the educational process not only as a measure of learning objectives, but also as a meaningful assessment to directly inform practice (Twyman, 2014). Extensive technology and media integration in the classroom creates the unique opportunity of making competence-based, personalized education a reality.

In order for learners to keep up with the brisk changes in accessing resources, they need to have a flexible cognitive schema (Patrikakou, 2015). This cognitive flexibility allows learners to quickly adjust their thinking and adapt to technological advances and their applications. A flexible cognitive schema is supported by fluid reasoning - the capacity to think logically and solve problems in novel situations) and relates to fluid intelligence, reading fluency and reading comprehension (Cattell, 1987). In the context of rapid technological advances, cognitive processes, which are part of learners' personal competencies, assume an even more pronounced role: learners without a flexible cognitive schema will struggle to keep up with new advances and, therefore, with accessing and processing information and developing skills.

A way to foster a cognitive flexible schema is by placing an emphasis on the four personal competencies of the learner (Redding, 2014):

- **Cognitive competency** consisting of prior learning, associations to new concepts, and facilitating new learning

- **Metacognitive competency** including self-appraisal and self-management (task analysis & goal-setting, implementation, incorporating feedback, adapting or modifying). Aspects of the metacognitive competency are also part of the social and emotional competency.

- **Motivational competency** triggered by teachers' extrinsic incentives, and leading to the student's intrinsic motivation for exploration, discovery, and mastery.

- **Social/emotional competency** involving self-awareness, social awareness, self-management, responsible decision-making, and relationship skills (CASEL)

Technology allows for limitless possibilities for enhancing personal competencies. In order to best guide and support differentiated student learning in this fast-changing era, schools around the U.S. have begun to adapt a paper-free approach to learning, doing away with books and notebooks. Students are provided with (or bring to school their own) laptops or tablets which they ferry to and from school. Would this further widen the access to education gap among different socioeconomic strata?

Recent studies and articles on the matter indicate that spending on America's schools has more than doubled over the past forty years, with the majority of spending going to textbooks and desktop updates with very little impact. Hand-held devices such as tablets and ipads set up with appropriate software that addresses the Common Core Standards, seem a much better allocation of funds to maximize the benefits of educational spending, and also offer more personalized educational experiences to all students and not just those who have better access to resources at home (Technology in classrooms, 2014).

In the sections that follow, a discussion will be presented on ways through which technology can be meaningfully integrated into instruction and homework. The flipped classroom framework and its impact on the four aforementioned personal competencies are discussed as a broader context in which media integration in the classroom can foster competence-base, personalized education.

### 3. Flipped classrooms: A new concept in education?

Teachers have always required students to complete readings and come prepared to class, not only for concepts already introduced in class, but also for forthcoming events, facts, readings, and concepts. This "requirement" lies in the core of flipped classrooms, where teachers use face-to-face time primarily not for lecturing, but for guiding and assisting students through mastering and applying concepts, thereby increasing the value of classroom face-to-face time.

Contrary to general belief, the emphasis of such a model is not on the technology use per se, but on the pedagogy behind it, as the flipped classroom model is not just a tech-centered, spin-off of an old approach. The prospect of media development and integration can make teachers wary of yet more requirements to which they would have to tend. However, as Sams and Bergmann (2013) note, flipped classrooms are "not about how to use videos in your lessons. It's about how to best use your in-class time with students" (p.16). This also includes providing feedback faster, and involving students more meaningfully in mastery monitoring, and in more interactive and individualized assignments (Gullen & Zimmerman, 2013). After all, with access to open resources on the web, many such instructional media supports are publicly accessible, and teachers can utilize them without having to reinvent the wheel. As

President Obama has stated in discussing tech push in US schools: "Technology is not a silver bullet; it's only as good as the teachers who are there" (Holland, 2014).

### 3.1. Flipped classroom aspects and competencies

A starting point is to examine which courses are best-suited for the flipped classroom model or a technology enriched classroom – not all are equally well-suited to such a framework. Next, it needs to be decided what aspects can be removed from in-class time and be reviewed and completed by students prior to coming to class with the use of technology. This offers opportunities to review prior knowledge and encourage connections to new topics, both integral parts of the cognitive competency. It also challenges students to familiarize themselves with terminology, facts, and ideas as they prepare for in-class analysis, discussion, application, and problem-solving. Such a feature also tends to the motivational competency by stimulating intrinsic motivation and capitalizing on children's inquisitiveness, and inspiring exploration and discovery. Having students watch video lectures and other media can also enhance student engagement and increase learning, since it provides students with the element of "self-pacing". In this way, students who are able to accelerate through material, they will be enabled to do so (Goodwin & Miller, 2013).

During class time, teachers can check, reinforce, and differentiate instruction to best address student needs. Spending more time interacting with students also offers the opportunity to better understand their reasoning, what they are learning, and to clarify points along the process, as needed (Moore, Gillett, & Steele, 2014). This emphasis on processes is essential for cognitive and metacognitive competencies and it is fostered in the classroom by teachers providing direct feedback, assisting students with planning, analyzing, and problem-solving, instead of students completing homework in isolation. The combination of flipped homework and in-class work also nurtures intrinsic motivation as students assume more responsibility for their own learning and, therefore, derive more satisfaction from their mastery and achievement. In addition, by having students monitor their own learning, self-awareness (a component of both metacognitive and social/emotional competencies) is also enhanced and contributes to self-management and responsible decision-making.

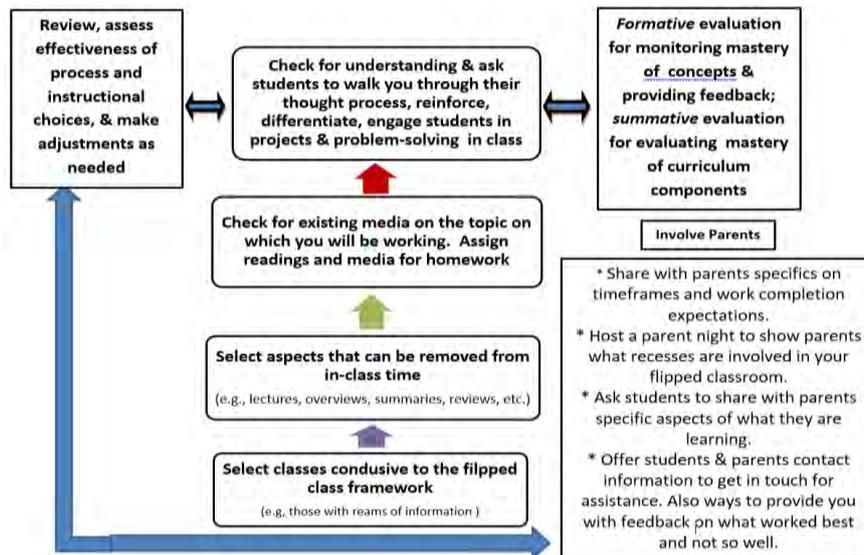
Evaluation also assumes a different role as students are assessed along the way, ensuring that curricular components are mastered by student before they move to the next one. Along these lines, differentiated instruction and project-based learning are highly compatible with the flipped classroom framework, and provide teachers with the opportunity of better integrating such aspects in their practice. Within a flipped classroom, teachers can engage in formative evaluation to monitor student learning, provide targeted feedback, intervene early, and inform their instructional practice in more direct ways than in a traditional classroom. It is important to note that this formative evaluation process is also encompassed in Multi-Tiered System of Supports (MTSS; also known as Response to Intervention, RTI) which are being adopted by an increasing number of states and school districts in the US. Teachers with flipped classrooms can also fulfill MTSS requirements through their classroom routine, instead of treating such requirements as an add-on. The flipped classroom framework offers an organizational basis that can actually cut down time for monitoring and record-keeping, since both of these components are inherent in a technology- and media-enhanced framework. Allowing for such formative evaluation process also decreases the probability of unfortunate surprises in summative evaluations, sometimes occurring in high-stakes assessments, when teachers struggle to understand why students did not perform as expected on a test, despite all efforts.

Summative evaluations can also be individualized, therefore closely addressing students' personal competencies and better assessing mastery levels. As Bergmann and Sams (2013) suggest, setting clear, discrete learning objectives, and creating a test bank with several items for each learning objective will enable instructors to develop exams that will differ for each student but that will test the same learning objectives. Lastly, instructional decisions are made based on an ongoing, real-time data collection. Therefore, time between data collection and informing classroom practice is minimized to best fit student learning and create a tighter association between desirable behaviors and instruction.

Moving from a knowledge-transfer model, also has implications for homework. The nature of homework changes as students have many more opportunities to engage in problem-solving and in-class applications with teacher guidance and assistance. Since the focus of competence-based, personalized education is on the learner being able to demonstrate content understanding and skills proficiency while practicing in class, instead of completing a traditional-type of homework, allows for close monitoring, immediate intervention as needed, and direct demonstration of mastery. Another important aspect is that homework completion and student engagement increase in flipped classrooms, even in subject-matters such as math, that may alienate some students (Moore, Gillett, & Steele, 2014). This finding is an indication of increased motivational competency, with students pursuing discovery and mastery as a reward. In addition, flipped and technology-enhanced classrooms allow for peer-mediated instruction, where students work together on problem-solving tasks, learning from each other in the process, which has been shown to be an extremely effective instructional tool to increase the academic, social, and emotional competencies of all students (Bell & Carter, 2013). This integration of social and emotional

competencies and dispositions is another important aspect of competence-based education, as achievement in school and in life does not only require academics, but also intrapersonal and interpersonal skills (Weissberg & Cascarino, 2013).

Figure 1. Technology-Enriched and Flipped Classrooms: Competencies, Processes, and Parent Involvement.



#### 4. Flipped classrooms, flipped homes?

Since a flipped classroom format places an emphasis on student preparedness prior to coming to classroom, does it follow that flipped classrooms require families to take on a greater role in their children's education, and become ad hoc instructors? This would be an erroneous inference and the antithesis of what lies at the core of the flipped classroom approach. First, students have always been asked to complete work at home, and parents have always been faced with homework questions, some of which they could address, others needing teacher assistance the following day. The nature of homework requirements within the flipped classroom changes as the applications are completed in class, while informational aspects must be studied at home. This change seems to be appreciated by students as they welcome the opportunity to review lectures, or other online material as many times as each needs to have a solid basis going to class (Fulton, 2012).

Second, and directly tied to the previous point, inherent in the flipped classroom approach is enhancing the independence of the learner which is an essential element for the net-generation. Not only because extended computer use and access to information has forced more independence and individuality of learning, but also due to the globalization of knowledge and the job market, which make learner self-reliance and independent information-seeking a must for success.

Extended technology use by schools, not only within a technology-enhanced classroom framework, but in a school's general outreach to families, has been shown to enhance and strengthen home-school collaboration. For example, tech-based logging of tardies and absences can directly alert parents and keep them informed in real time. Schools' intranet systems also allow parents to monitor student progress, as well as content and activities, on demand. Communication, especially between teachers and parents of students with learning or behavioral issues is also increased, and, by keeping parents informed and involved, arguments between parents and children are reduced, and a stronger bond can be forged between parents and children on learning issues. In addition, school personnel benefited from the enhanced parent involvement by gaining more insight into students' home environment, leading to higher commitment and trust between school personnel and parents (Telem & Pinto, 2004).

Technology can also facilitate various home-school interactions in additional ways. Specifically, proactive communication between teachers and parents becomes easier and faster, and, therefore, it can further enhance home-school partnerships, a powerful factor in academic, social, and emotional learning (Patrikakou, 2015, 2016). With the convenience of technology, schools can establish bi-directional, ongoing, mutually-beneficial interactions that enhance clarity of expectations, detail student progress, and keep parents abreast of pertinent information (Olmstead, 2013). With the physical presence of parents not necessarily required at school in order to actually be involved in school, not only home-school communication can be enhanced, but also parent involvement in the educational process, in general can be increased. Parents can be connected and electronically present in school happenings more frequently, overcoming time and location barriers posed by job and other family responsibilities.

Opportunities for additional parent involvement at home are also created, with students sharing with their parents media and discoveries involved in their new homework - this can be facilitated by teachers, and also by parents themselves with teacher encouragement and guidance. In this way, students can use their tech-savvy ways to connect with parents and include them in their media-dominated world meaningfully, instead of alienating and isolating themselves from them (see the Figure 1 for the inter-relationships of processes in technology-enriched and flipped classrooms, and parent involvement).

#### **The clock is ticking...**

A shift in pedagogical thought has emerged prompted by the technology and internet boom, shifting workforce demands, and the reality that the global pace of change is swift, decisive, and irreversible. Inherent in the demands that these changes pose is the realization that successful learners must have a flexible cognitive schema in order to deal with the ever-changing patterns and needs, and, also, to be nurtured within the framework of competency-based, personalized, technology-embracing education. As with any and every innovation, its use is as good as its users. Technological enrichment can enhance classwork and homework, but, also, it has the potential of significantly strengthen home-school relationships to further support student success in school and beyond.

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## TECHNOLOGY IN TRANSLATION TRAINING

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### **Abstract**

Recent decades have faced a rethinking of translation processes and an integration of social dynamics and continuous learning into the translators' work. Technological advances and global business and communication have required translators, as well as other language mediators, to be part of a large network of agents and communities of practice in order to share knowledge and develop best practices. The demand for translation has increased significantly and the deadlines for delivering translations in multiple languages have gotten shorter: for both translators and organizations seeking to produce multilingual content, technologies have become a strategy to increase productivity but also to learn and communicate better. However, the need to integrate technologies in translators' formal and informal education presents various challenges, as technology users need to learn how to use these tools strategically and manage their expectations with regard to the benefits associated with technologies. Users also need to acquire specific skills to be able to adapt to the evolution of the translation technology market and the complexity of translation projects. This paper presents an overview of various technologies used by translators, highlighting problems that can arise from an uncritical use of technologies.

**Keywords:** *Translation technologies, translators' training, critical use of technologies.*

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## THE CREATIVE DEVELOPMENT FROM THE APPLICATION OF URBAN SKETCHING IN THE ACADEMIC CONTEXT

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### Abstract

The present scientific work is developed in the field of art and culture in academic scope, as Project of Extension, titled: Artistic Design - Intermediate Level. Directly related to the Pro-Rectorate of Extension and Culture and Extension Directorate of the Fluminense Federal Institute of Education, Science and Technology, Campus: Campos-Centro - in the city of Campos dos Goytacazes / Rio de Janeiro-Brazil, by edict n° 139, of December 17, 2015. In this context, it aims at the application of Urban Sketching, which consists of sketching in loco sketching urban landscapes without theories or complex artistic ideas, stimulating and enhancing the creativity of participants from their practical activities of teaching in Artistic Design, proposing that its use be a pedagogical instrument conducive to and potentiating the creativity, perception and sociocultural relations of the internal student community and society as a whole. It is therefore envisaged (a) to create practical and theoretical weekly meetings for the participants, proposing activities through the plastic language in question, which favor the perceptive, cultural and social development of the participants; (b) investigate how the process of perception and creation occurs in the face of the challenges proposed in the project; (c) to accompany, describe and evaluate in what ways creative intervention can be useful as a didactic resource; (d) to verify that the practice in Urban Sketching is capable of empowering participants with respect to creativity, perception and socio-cultural interaction and (e) disseminating online all artistic production during the Project, in an attempt to form the first group of Urban Sketchers of the city of Campos dos Goytacazes. With methodology based on the qualitative approach, in a context of action research and participant observation. Configuring itself as an extension, integrative activity that enables a transformative relationship between the said campus, its students and the external community. From this point of view, various sectors of society maintain a link with the Institute of Education, with a view to facilitating, among the parties, (re) construction and production of knowledge, pedagogical processes of inclusion, access to essential information about values and cultural citizenship.

**Keywords:** *Creativity, Creative Process, Urban Sketching.*

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### 1. Introduction

A worldwide phenomenon, the Urban Sketching is gaining new fans around the world every day. In its main capitals has been mobilizing huge contingents of people, and interest groups in common. In fact Urban Sketching is nothing more than a spontaneous graphic record, usually done in pencil, nankin pen, watercolor or mixed technique, carried out in person, in front of a specific urban landscape in a sketch book, using only the direct observation, without any type of digital or analogue resource. The following is a transcript of Urban Sketchers manifesto from *Urban Sketchers International* blog: (a) We draw on location, indoors or out, capturing what we see from direct observation; (b) Our drawings tell the story of our surroundings, the places we live and where we travel; (c) Our drawings are a record of time and place; (d) We are truthful to the scenes we witness; (e) We use any kind of media and cherish our individual styles; (f) We support each other and draw together; (g) We share our drawings online; (h) We show the world, one drawing at a time.

Based on these principles and taking advantage of its playful character, as well as the students' interest in its practice, one of the strong points of Urban Sketching has been its application in the academic educational environment. Reinforcing the teaching of *Observation Design* (Discipline taught by the researcher in the Bachelor of Architecture and Urbanism Course in Fluminense Federal Institute of Education, Science and Technology, Campus: Campos-Centro), the development of the perception, visual acuity and creativity of the students involved. The practice of Urban Sketching in the academic and

extension context, addresses the use of the artistic language in question, associated to playful pedagogical dynamics that seek to encourage the creative process of students and participants, articulated mainly from the awakening of sensitivity, interest and imagination, in the search for the construction of a creative, attractive and innovative didactic action.

Weekly meetings of approximately two hours each are planned and developed, in the form of theoretical and practical classes based on Urban Sketching, which aim, from their practice, the creative development of students, subjects of the research.

Considering creativity as a natural phenomenon inherent to the human being in which its application is transposed naturally into the dimension of doing. Understanding the student in his possibilities and potentialities, trying to demonstrate that his constitution as subject is not devoid of cultural and social meanings.

We focus on the problematic, to discuss: in what ways can the use of Urban Sketching associated to the artistic language of the observation design develop creative potential and stimulate the creative process of students participating in the project?

## 2. Objectives

It is therefore envisaged (a) to create practical and theoretical weekly meetings for the participants, proposing activities through the plastic language in question, which favor the perceptive, cultural and social development of the participants; (b) investigate how the process of perception and creation occurs in the face of the challenges proposed in the project; (c) to accompany, describe and evaluate in what ways creative intervention can be useful as a didactic resource; (d) to verify that the practice in Urban Sketching is capable of empowering participants with respect to creativity, perception and socio-cultural interaction and (e) disseminating online all artistic production during the Project, in an attempt to form the first group of Urban sketchers of the city of Campos dos Goytacazes, Rio de Janeiro/Brazil.

## 3. Creativity and the Creative Process

The challenge in defining the phenomenon of creativity can be found in its subjectivity and complexity, in addition to the scarcity of published works on the subject, the definition of creativity is a subject of investigation itself (LUBART, 2007).

According to Rouquette (*apud* LUBART, 2007, p. 7), "The difficulty of the scientific study of creativity has the ubiquity of the concept, and the researcher's job consists above all of defining its contours".

Vygotsky (2009), identifies the creative activity as the one in which man creates something new, independent of being something external physical or internal as a thought or idea and second Ostrower (2009): to create is basically to form. It is being able to shape something new. Whatever the field of activity, in this "new" it is about new coherences that are established for the human mind, phenomena related in a new way and understood in new terms (p. 9).

For Peixoto (2008, p. 40): the creativity in arts represents a form of mobilization of actions that results in constructions of new things, from the nature and the culture, being also, result of imaginative expressions, coming from emotional and cognitive syntheses.

Turn, Sternberg, Kaufman e Pretz (*apud* LUBART, 2007, p.16), define: "a new production is original and unforeseen when it is distinguished by the subject or by the fact that other people did not realize it."

In his studies on the "promotion of creative ethos", Bahia (2008) considers all people potentially creative and proposes curiosity and discovery as the essence of creativity, appropriating a representation of one's own creativity, enabling communication and Creative expression of personal experiences (p.233).

As the Brazilian educator and philosopher Freire (2010) argues: Curiosity as a questioning concern, as an inclination to the unveiling of something, as a question verbalized or not, as a search for clarification, as a warning signal that suggests alertness is an integral part of the vital phenomenon . There would be no creativity without the curiosity that moves us and that puts us patiently impatient with the world we did not do, adding to it something we do (p.32).

Vigotsky (2009, p.14), adds that creative activities are intimately linked to imagination: In fact, imagination, the basis of all creative activity, undoubtedly manifests itself in all fields of cultural life, making artistic creation possible, the scientific and the technical. In this sense, necessarily, all that surrounds us and was done by the hands of man, the whole world of culture, unlike the world of nature, all this is a product of the human imagination and creation that is based on it.

Within this relationship of imagination / creativity we associate imagination as one of the main components belonging to the sphere of creativity linked to work with Art, defining creativity as the most notorious characteristic of work and artistic making.

In this sense Vygotsky (2009), emphasizes the importance of this relation: The imagination acquires a very important function in human behavior and development. It transforms into an application of an individual's experience because, based on the narration or description of another, he can imagine what he did not see, which he did not directly experience in his personal experience. A person is not restricted to the circle and narrow limits of his own experience, but can venture beyond them, assimilating, with the help of imagination, the historical or social experience of others (p. 25).

In addition to creativity, sensitivity and imagination, which are intended to be developed during the meetings in Urban Sketching, the socio-cultural interactions between students, between teacher-student and academics, and vice versa, may enhance the creation of these new combinations through of possible exchanges of experiences during the application of the research during the said Extension Course.

The weekly meetings in Urban Sketching focus on plurality, and understanding it as a facilitating and articulating principle of knowledge, implying forms of educational work in diversity. According to Vygotsky (2008), human development is closely linked to learning, being this one of the main sources of concepts and a powerful force that directs the destiny of its mental development.

Thus, the experiences in Urban Sketching are committed to the integral development of the students, perceiving the artistic languages as sensitive forms of perception, creation and expression. This form of understanding goes in the opposite direction of a teaching practice practiced in contemporary society, which still prioritizes verbal language, to the detriment of other subjective languages.

#### **4. Methods**

In the quest for global understanding of phenomena, the scientific work presented seeks a methodology based on a qualitative approach, as a way of reflection and analysis of reality through the use of methods and techniques for detailed understanding of the object of study in a context of action research and Participant observation. Therefore, we assume a participant behavior in the search for understanding and social significance in the environment, space and time lived in the development of the meetings in Urban Sketching, sharing cultural experiences with the participants (CHIZZOTTI, 2003: p.82). We then created a reciprocal relationship between the nodes as a researcher and the subjects of the research, which was not undone at any time during the beginning and end of the research. Such symbiosis, according to the author, "is indispensable to understand the links between people and objects, and the meanings that are constructed by the subjects" (CHIZZOTTI 2003: p.84).

The corpus of empirical research consists of (a) the written record of each Urban Sketching meeting, by the researcher; (b) analysis of the artistic production and the creative process of the academics: drawings, attitudes, behaviors, dialogues, solutions, etc.; (c) recorded recording; (d) interviews with students; (e) photographic records and filming; (f) careful and continuous observation.

After completing the data collection, we began the more formal phase of the analysis. Based on a set of descriptive theoretical categories, based on the theoretical reference of the study, the first classification of the data was done, according to Lüdke and André (2010), coding theory. This allowed the division of the material into its component elements, without, however, losing sight of the connection of these elements with the others. Having as categories: creativity and the creative process and social interaction.

#### **5. Conclusions**

In the course of the Extension project that we are developing and applying, it has been possible to note behaviors and attitudes useful in the analysis and understanding of the data that the research proposes. As a result of the analysis of the graphic production and the creative process of the participants, we began to verify how the practice in Urban Sketching during the application of the Project of Extension, titled: Artistic Design - Intermediate Level can contribute to the development of creativity and of the creative process, as well as of social interaction, favored by Vygotsky (2009), for working on issues associated with imagination, expression and aesthetics, thus contributing to a more meaningful overall formation of its participants.

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## REMOTE ACCESS TO A PHYSICAL LABORATORY

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### Abstract

Within this article, a real existing physical laboratory is presented, which can be accessed from anywhere at any time with a simple web browser. No additional software or hardware is needed. The laboratory offers engineering students the possibility doing practical exercises without being present at the laboratory's site.

Especially for engineering students, practical exercises are essential for understanding system behavior. Main target group of the laboratory are distance learning students, which are often employed and living far away from their university. Thus both time for travel as associated costs are a problem. A second target group may be students of conventional universities, where the pool of laboratories can be enlarged by remote laboratories without any further costs.

The laboratory presented belongs to mechanical engineering and mechatronics. It is an example from a pool of remotely accessible laboratories in the context of mechatronic and robotics. It consists of a gearing mechanism with sensors. The wheels of the gear chain are actuated by a motor. When started, the motor executes specific motion profiles. These motions evoke typical effects of gears with toothed wheels, such as vibration, elasticity, and backlash. These effects are measured by the sensors and logged in a file. Students can display the results as graphics. Several methods for analysis are offered by the laboratory, such as FFT (Fast Fourier Transform).

As for many other laboratories, this one needs exclusive access for one student at a time. Thus a strategy has been implemented to guarantee that if one user started a laboratory session, no other can get access. To avoid complicated booking mechanisms, a simple exclusion procedure blocks the laboratory for a pre-defined time as soon as a student started a session. If needed, a supervisor can unlock the laboratory at any time.

The laboratory is on duty since several semesters, numerous students completed it successfully. It is accessible at any time, 24/7.

**Keywords:** *Technology education, distance education, laboratory exercises, remote access.*

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### 1. Introduction

Distance Learning is an established alternative to conventional universities especially for students already employed. The same holds for those who are housebound by family duties or medical reasons. For all of them, attending courses or practical exercises at a specific location and a given time may cause severe problems, see Borgolte (2011), Solbjørg (2007), West, Spencer, and Willey (2004). These problems are related to time (for travel and attendance), financial resources (for travel and accommodation), and logistics (e.g. if assistance is needed or a substitute must be employed for the students' duties).

But especially in engineering sciences, laboratory work is an essential part of education. It is necessary to provide understanding of system behavior. With the increased computational power available, simulation and animation of physical systems became very realistic. Thus several universities already use these technologies in their curricula, see Jiménez and Rodriguez (2006), Lemos, Leão, and Soares (2008), Ruzhitskaya and Speck (2008). But if noise or random effects severely influence the system behavior (e.g. due to friction when braking a vehicle), simulation may result in non-realistic effects.

In this case, experiments with real systems are inevitable. Thus students normally have to take the burden and travel to their university. Sometimes, video streaming is offered to watch the laboratory setup, but in general this does not provide enough information to understand and analyze the system. An

alternative is a fully remotely operable laboratory, see Bauer and Fedák (2010), Teichmann and Faltin (2002). This includes access to all data generated and support in analyzing this data.

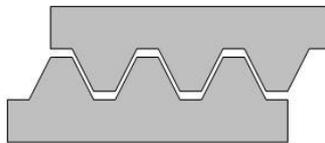
The Control Systems Engineering Group at FernUniversität in Hagen started development and implementation of remotely accessible real laboratories in the late 1990s (Röhrig & Jochheim, 1999). The gearing lab described in this article is the most recent one.

## 2. Scientific background of the laboratory

Mechanical gears, especially those with teeth, show some effects which can cause problems in certain applications. These effects are elasticity, backlash, and vibrations. Problems may occur if very exact positions are required, or if vibrations affect adversely the system behavior. This laboratory supports understanding of these effects and mathematical modelling of the gearing mechanism.

The effects considered in this lab are due to the construction of toothed gearings, see figure 1. The elasticity results from deformations of the teeth when under strain. The backlash is an effect if the teeth are not always in contact with both sides, thus able to move a little bit before in contact again. Vibration results both from elasticity, if the material moves back to its original position, and from backlash, if oscillation is forced by abrupt contact and release of contact. As the system is a real physical system, random effects influence the behavior, thus the data differs slightly each time the experiment is started.

Figure 1. Toothed gearing.



## 3. Technical implementation

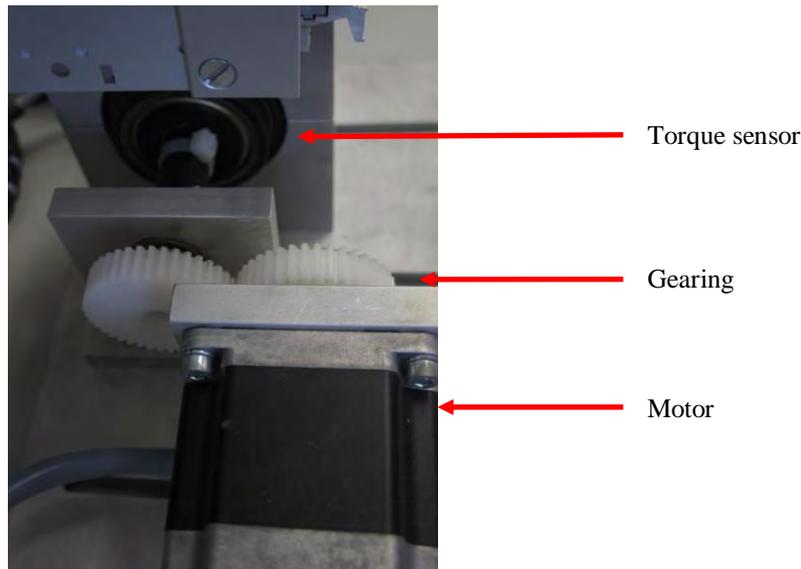
The whole system without computer is shown in figure 2. Main part of the laboratory is a plastic gearing. Plastic is used for didactical reasons, as it is less stiff than metal, thus the effects are more noticeable. The decision was made for economic reasons, as the sensors needed are much cheaper for plastic gears than for metal gears. The wheels are driven by a stepper motor, which is executing pre-defined motions for the diverse measurements. The resulting positions of the wheels are measured by rotary encoders, the resulting torque by a magnetic particle brake.

Figure 2. Setup of the real laboratory.



Figure 3 shows the main components motor, gearing, and torque sensor. Rotary encoders are mounted on the back sides of the motor and the torque sensor, respectively. The laboratory is controlled by a standard Windows-based computer. The motor is driven by a controller which is connected to the computer via USB. The torque sensor is driven by a controller which is connected to a PCI A/D converter board.

Figure 3. Motor, gear, and sensor.



The computer is directly linked to the internet; it is running IIS (Internet Information Service). The users can connect to IIS via a standard web browser, no add-ons or additional software is needed. ASP.NET (Active Server Pages) provides the web application; the connection to the controllers and position sensors is made via C#.NET code.

Due to the nature of the laboratory, it is necessary to restrict access to one user at a time. This is done by a rather simple mechanism for mutual exclusion. As soon as one user logs in, a flag is set and a timer starts running. If the flag is already set, admission is denied and the user is asked to try again later. When logged in, each activity resets the timer. After a pre-defined time of inactivity the flag is reset and the lab is accessible for other users. This mechanism works well if few users try to log in or if there are considerable times of inactivity. It is much simpler than a booking system and provides more flexibility under the conditions mentioned.

#### 4. User interface

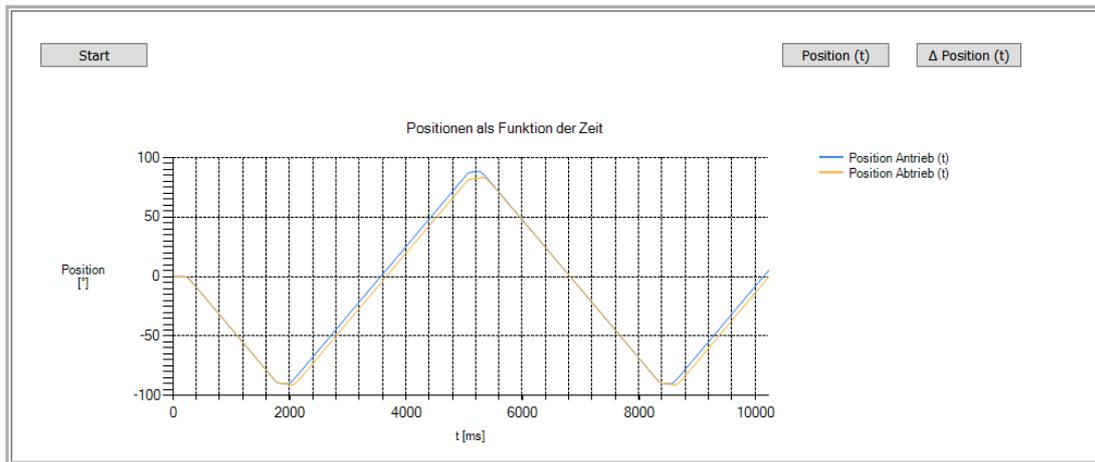
The laboratory provides three exercises: on the backlash effect, the elasticity, and on vibrations of the gearing. All exercises are highly automated, i.e. the user starts an experiment, but the whole procedure is predefined and runs without any intervention. For each exercise, a specific profile of movement is executed by the motor, resulting in rotation of the wheels which are sensed. The sensor readings are locally stored and displayed as graphics to the user.

Students are asked to interpret the behavior of the gearing, as documented in the graphs. In addition, they should calculate some characteristic numbers, although there is no need to be very exact. This is due to the fact that students only get the graphs, but no data file for analysis.

##### 4.1. Analyzing backlash

The following holds if there is not always contact on both sides of the teeth. When the actuated wheel of the gearing (the *drive side*) starts moving in the direction of the teeth gap, there is no rotation of the second wheel (the *output side*) until contact is made. After that, both wheels rotate with the same velocity until the end of actuation. If now the motor reverses, this behavior is repeated. Figure 4 shows the position of the wheels over time with an alternating motor cycle. Additional differences in motion of the wheels may result from elasticity, if the teeth are deformed under increased application of force and returning to their original form as soon as external force is decreased.

Figure 4. Exercise: Backlash effect.

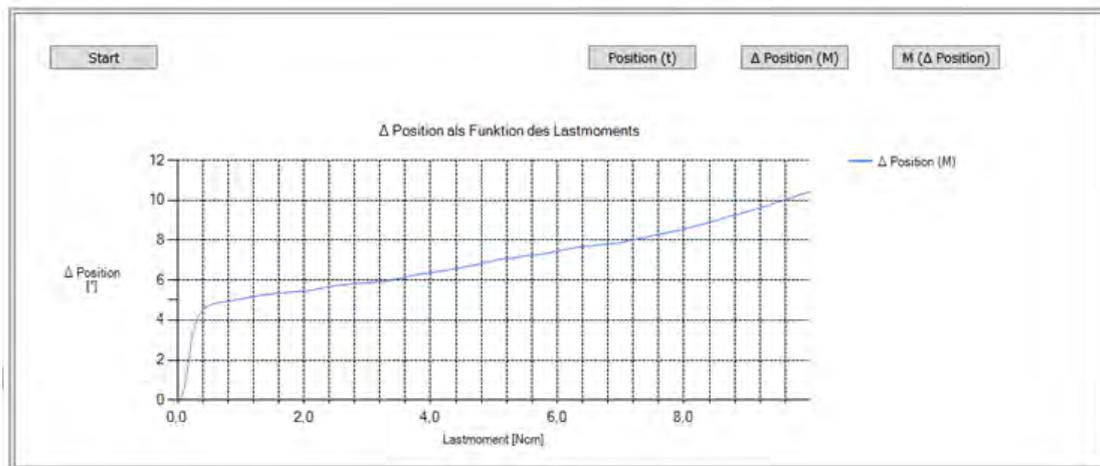


#### 4.2. Analyzing elasticity

As mentioned before, teeth might change their form when force is applied. Even for very stiff material like steel, this behavior can be observed in most gears. The effect increases if the output side of the gear reacts with a counteracting force. For elastic material like metal or plastics, the deformation is repealed as soon as the acting force is decreased. For most materials, the deformation is not linear with the force applied.

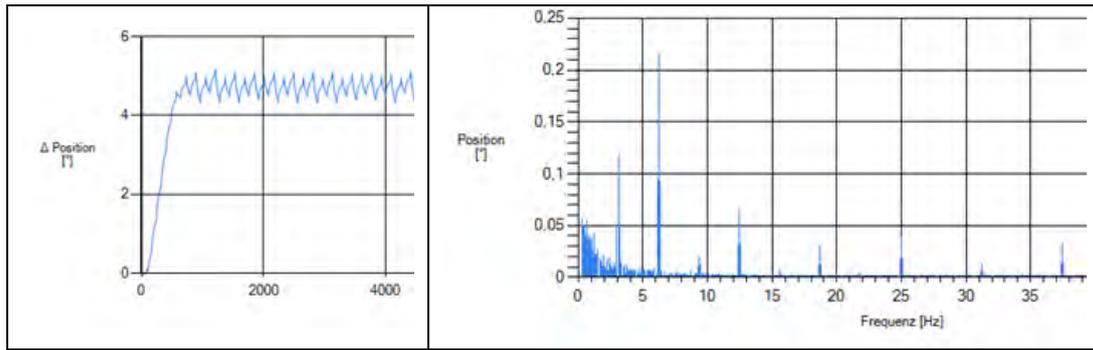
In figure 5, the difference of positions between the drive side and the output side is shown as a function of torque applied. At the beginning, the backlash allows a movement of about  $5^\circ$  without major torque. Now the teeth are in contact, but the material is deformed. The difference shown results from deformation of all mechanical parts, not only the teeth. The deformation shows an exponential characteristic.

Figure 5. Exercise: Elasticity effect.



#### 4.3. Analyzing vibrations

There are various conditions for vibrations, but within the context of this laboratory, only one of them is of interest. This one is periodic external stimulation, caused by the characteristics of the stepper motor. Figure 6 shows on the left side the slightly swinging difference of wheel positions. This figure gives a qualitative result, but is not well suited for a quantitative analysis. For this, a FFT (Fast Fourier Transform) is offered; the result is shown on the right side of figure 6. There, the frequencies of this vibration are diagrammed. There is a major peak at 6 Hz, accompanied by further harmonic oscillations as multiples of 6 Hz.

Figure 6. Exercise: Vibrations. Left:  $\Delta$  position, right: frequency analysis

## 5. Conclusion

The system presented is part of a number of laboratories for distance learning students of engineering sciences. These real physical labs offer remote operation. They allow observation of physical effects and identification of system parameters. Users can test system behavior under varying conditions, e.g. with different control architectures, parameters or various filter algorithms. Users are enabled to have access to the labs from any location in the world, at any time with a simple internet connection. No special hardware or software is needed.

The look-and-feel of these labs is very similar to hands-on operation. The data students get for system analysis are the same as in a presence lab. By means of these labs, students are relieved from attending practical exercises at a given location and time. With the possibility of integration in a laboratory pool of several universities, the number of labs available can be much higher than at a single university.

Students profit from flexible timing for lab operation, the possibility to re-try exercises, a broad range of laboratories available, and access to the exercises in parallel to their individual progress in learning the theoretical background material. The labs successfully served several hundreds of students.

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## **MASSIFICATION OF HIGHER EDUCATION IN BOTSWANA: OPPORTUNITIES AND CHALLENGES**

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### **Abstract**

African higher education has witnessed massive increases in enrolments due to improvements at the primary and secondary school levels, coupled with the realisation that higher education qualifications help in economic development and improved standard of living for the individuals and the society. Botswana is one of the countries in Africa that is faced with high enrolments in tertiary institutions. This position paper examines the opportunities and challenges emanating from massification of higher education in Botswana. It concludes, by discussing some possible solutions to the problem.

**Keywords:** *Massification; Higher Education; Opportunities; Challenges.*

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### **1. Introduction and General Overview**

African higher education has witnessed massive increases in enrolments due to the improvement at the primary and secondary school levels, coupled with the realisation that higher education qualifications help in economic development and improved standard of living for individuals and the society. Botswana unveiled its second National Policy on Education in 1994. Popularly known as the Revised National Policy on Education, this policy had as one of its aims, the need to increase access to education for Botswana (RNPE, 1994). Government's efforts to provide education to the people was further reinforced in 2007, when it started sponsoring students in higher education at private institutions of higher learning in Botswana. This venture by the government contributed immensely to the massification of higher education in Botswana. Botswana is one of the countries witnessing the current wave of globalisation and internationalisation of higher education. The globalisation phenomenon and its impact have played a significant role in the expansion of higher education enrolments. This scenario has been coupled with increasingly privatised and market oriented strategies to create education opportunities to meet the ever increasing demand for higher education. This situation is not unique to Botswana, but, is also being experienced in other continents of the world. China, Taiwan, South Korea, Japan and Hong Kong have recorded a dramatic increase in the higher education arena (Mok, 2016).

The driving force behind Massification of Higher Education differs from one geographical area to the other. Massification of higher education was triggered off by the financial boosts given by several countries to improve higher education in the 21<sup>st</sup> century. In addition, improved living conditions for the middle income group from the middle of this century gave it an ample opportunity to gain access into institutions of higher learning. Many countries experienced a significant expansion in their national economic growth, which led to an increasing demand for highly skilled workforce. The demand for highly skilled force found its solutions in the corridors of institutions of higher learning meant to provide skilled personnel. Thus, academic qualifications and certifications from higher institutions of learning became synonymous with improved standard of living and status in the society. The more people realise the benefits accruing from higher education, the more the institutions of higher learning expand to a significant level. Chacha (2004), states that, universities have become powerful institutions in societies that determine positions of authority, prestige and power. The benefits of acquiring higher education qualifications became so glaring that it has a direct effect on the access to higher education institutions, hence, Massification (Misaro et .al, 2013).

In Africa, the main reason for massification of higher education could be attributed to the pressure from secondary school leavers wanting to further their education. Rapid population growth mainly among youths put the governments under pressure to embark on projects that will facilitate access to primary education in Africa in the 1980s. The increase in primary school enrolment led to an increase

in the enrolment of secondary school students. Output from the secondary education level led to a dramatic expansion in the higher education enrolment. There was also the issue of expansion at the higher education level emanating from the structural adjustment programmes which required African countries to embark on investments in basic and primary education which spiralled an increase in higher education enrolment (Lusenge, 2016).

In 2007, the government of Botswana extended its education sponsorships initiatives into higher education, from public higher institutions of learning to privately owned higher education institutes. This was a fundamental step in the higher education landscape which one could say, triggered off the massification of higher education in Botswana. This massive enrolment of students in Botswana's tertiary institutions has had a tremendous impact on tertiary education operations and its accessibility to the citizens (Molutsi, 2009). In an effort to encourage more enrolment in the higher education sector; Botswana government established a Tertiary Education in Council in to manage the affairs of the higher education sector. Subsequently, enrolment ratios in tertiary institutions rose from 5.8% in 1996 to 12% in 2001, while, tertiary education attainment rate rose from 2% in 1995 to 7% in 2001. An increased enrolment at the higher education level comes with some opportunities and of course, some challenges too.

This paper therefore examines the opportunities and challenges emanating from massification of higher education in Botswana. It will discuss the benefits and opportunities accruing from massification of higher education; the challenges posed by massification and how these challenges could be addressed in order to ensure a favourable environment for teaching and learning in the face of massive enrolments in Botswana's higher education institutions.

## **2. Massification of Higher Education**

Massification of higher education is described as, a rapid increase in student enrolment in the later part of the twentieth century. It is a widening participation movement in higher education in different parts of the world (Misaro et al 2010). In the context of more developed and industrialised countries of the world, massification refers to a high enrolment rate in higher education ratio of a country. A higher education rate of up to 50% is considered 'mass enrolment'. In the African and other less developed countries' context, Massification of higher education is viewed as rapid increase in student enrolment consistent over several years. Massification in Africa's higher education countries increased remarkably between 1999 and 2005 in the range of 12% to 60%. Big as this number might seem in percentage stated in this paper, the gross enrolment hardly exceeded 5 % (Goolam 2008). This obviously implies that, developing countries did not experience similar rate of massification across their borders. With massification, higher institutions of learning tend to compete with one another not only in the area of attracting qualified and eligible students; but also, from the angle of attracting and retaining quality faculty members and ample resources to cope with the increasing number of students. Altbach (1982; 2009) describe massification as a modern –day revolution in higher education. Massification has become so astronomical that most institutions of higher learning have no choice but to begin to wrestle with its implications especially from the point of view of the challenges and opportunities (Ntim, 2016).

## **3. Theoretical Background**

This study draws from the theory of Egalitarianism. The theory of egalitarianism emphasises on equality and equity in wealth, education and status. Marginsson (2006) cited in Lusenge (2016), asserts that, egalitarianism orchestrated increased enrolments in higher education which in some cases have threatened the stability of such institutions. The unprecedented increase in enrolment has seen institutions of higher learning grappling with issues of pedagogical quality, equity control, and management of assessment and funding. The road to success seems quite rocky for most African higher education institutions due to the seemingly unstoppable increases in higher education enrolment.

## **4. Benefits of Massification of Higher Education**

One of the major effects of massification in Botswana's institutions of higher learning is that the youths have been availed the opportunity of receiving higher education qualifications. Massification has resulted in the growth of new universities, expansion of different categories of tertiary institutions and the assimilation of new sectors into degree awarding institutions. Institutions of higher education have had glorious effects on other sectors of the society, as many have the opportunity of receiving higher education degrees which are catalysts to improved standards of living. The production of more educated

people has a positive effect in the development of the society. This has led to the production of educated people who have transformed the society through their contributions in various sectors of the economy.

Massification has made it possible for technicians to receive higher education degrees in various areas which they use to transform the economy of the country. This in effect has created markets for new and various cultural products, using graduates who serve the interest of the nation. In addition, increased enrolment in higher education and in different programmes has provided initiatives and innovations required in the economy. In Botswana, there are Universities of Technology and Innovation; offering courses in areas that promote self reliance and efficacy. Knowledge is acquired for the development of the society in the different sectors.

Mass higher education has made an enormous contribution in the area of production and distribution of knowledge, and opened avenues for increased market in the continuing education sector. People are eager to embrace change, train for, and acquire new skills and knowledge in the changing education landscape. It has motivated and inspired people not to stick to just one occupation, but to continuously seek, acquire new skills, competencies and aptitudes, needed to survive in the contemporary world. Botswana fully embraced the expansion of access to higher education to enable the youths face the technological challenges of the 21<sup>st</sup> century (Republic of Botswana, 1977; 1994). Increase in enrolment is seen as a democratising process to higher education and Botswana believes in the implementation of the principle of democracy (Iloanya, 2010; Adeyemi, 2010).

## **5. Massification of Higher Education and its Challenges In Botswana**

The unprecedented demand for access to higher education and the overall reality of lack of adequate resources to manage the upsurge has left many institutions of higher learning in a very tight corner. Governments do not give financial support to private institutions in most African countries. However, in Botswana, government sponsors students to both public and private tertiary education institutions. The sponsorship covers mainly tuition and book allowance. While the government public Universities receive funding for the maintenance of their universities, that is not the case with the private tertiary education providers (Lusenge, 2016; Onyango, 2016). Institutions therefore, face the challenges of raising funds to meet the increasing demand of students' expansion of facilities such as, lecture rooms, engaging qualified academic staff members, sanitation facilities, academic laboratories and equipment and other important facilities for the learning environment. Students from far locations need accommodation and most of them cannot be accommodated in the institutions' halls of residence.

Increased enrolment means increased number of faculty members. Private tertiary institutions are faced with the daunting task of recruiting qualified teachers to teach the students. While they grapple with the issue of finding quality teachers, they are also faced with the challenge of how to pay them. The success of any higher education institute depends on its ability to attract and retain quality academic staff. Massification has made this a more serious problem. In some African universities, large classes are created to tackle the problem of inadequate faculty members. Some institutions of higher learning have resorted to using part-time teaching staff to cut costs (Mohamedbai, 2014). The engagement of part-time lecturers has its drawbacks, since; the institutions engaging them will not have full control over how they carry out their day to day activities. One would find that even, the full time staffs are overloaded with teaching slots, coupled with other administrative tasks. The same faculty members are expected to participate in research which is one of the academic expectations from teachers at a higher education level.

Other burning issues include, students' tutorials and effectiveness in the facilitation of such; managing large classes, inadequate library and laboratories facilities, continuous assessments, the use of information and communication technologies (ICT) and quality examination procedures. While one acknowledges the fact that tertiary institutions need all these aforementioned facilities to function well from contemporary standpoints, how much funding do they need to be able to provide all these in their institutions? With the declining government funding in many institutions of higher learning due to the world economic recession, massification poses a great challenge. In spite of the fact that many governments are willing to increase their expenditure on education; they still fail to satisfy the demand due to inadequate funds (UNESCO, 2007). Botswana is one of the countries in Africa currently cutting down on the number of courses and students to receive government sponsorship. In the light of these developments, there have been cases of students becoming ungovernable in some Botswana's institutions, causing boycott of classes and in some cases, destroying valuable facilities in their institutions. Why? They are frustrated with challenges massification of higher education come with.

Massification poses the danger of producing graduates beyond market demand. Botswana is currently experiencing unemployment due to high turnout of graduates from the country's tertiary institutes. Mis-alignment of the curricular to the needs and demands of the market is one bid problem of massification. The country produces a big chunk of graduates who are unfortunately, not needed in the labour market. The result is a feeling of apprehension and frustration for these graduates, parents and the society.

## 6. Conclusion

Massification of higher education is a contemporary issue and one cannot shy away from the fact the problem exists with us. Most of the challenges hinge on the issues of funding, mis-match of the curricular and the job market, quality of the graduates that are produced in the face of expanding enrolment without a corresponding increase in the facilities provided, the quality of academic faculty members to manage the massive number of the students, students attitude to school work as they face some unexpected challenges of massification; it is a long list. In Botswana and in other African countries, one might think of some possible solutions to the problem. Some tertiary institutions in Botswana have come up with programmes they have offer on Distance Learning mode. Currently, Botho University, University of Botswana and Botswana College of Open and Distance learning run some online courses.

This is a step in the right direction as it reduces the massive physical presence of learners at the institutions at the same. It is necessary to note that, Distance Learning mode alone cannot solve the problem of massification if the same lectures are to set exams and mark for the large number of students. It takes one to the issue of Staffing. Institutions must engage and retain quality teachers to drive the vehicle of quality and learning in their institutions. Quality Assurance systems must be enforced to ensure that students get value for the money they pay, even if they are being sponsored by the government. In addition, government should create an enabling environment for the proliferation of higher education institutions, to allow market forces determine the costs of higher education.

Institutions should enrol students with correct entry requirements and carry out proper industry –needs analysis to ensure that needs are aligned to programme development and the number of students admitted in different programmes. If this is done, the problem of job market saturation could be avoided.

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## A PEDAGOGIC INNOVATION IN TEAMWORK

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### Abstract

Since 2006, the École Polytechnique de Montréal has integrated a teamwork approach into its twelve engineering programs. A compulsory 45-hour course (who employs active learning pedagogies and focuses on using students' experiences) on interpersonal skills and collaborative teamwork constitutes the starting point for a four-year team coaching program to guide students throughout all integrated engineering projects. As students work in teams to complete their projects (one per year / by engineering discipline), a group communication specialist (social psychologist) meets each team for approximately 60 minutes to help students put what they've learned into practice and to encourage them to develop their collaborative teamwork and interpersonal skills. Approximately 900 team coaching sessions take place each year at the École Polytechnique de Montréal. To track the advancement of these skills, a progress evaluation system is used for formative purposes in the first three integrated engineering projects, and for summative purposes in the fourth project.

The objective of my presentation is to showcase this innovative formula, a first for an engineering school, and to share some interesting results that demonstrate the success this approach has had in developing interpersonal and teamwork skills. I will outline the role and purpose of the experiential and introspective approach employed as an active learning pedagogy, as well as the tools and conditions that enable teams to gain awareness and take action.

**Keywords:** *Teamwork approach, teamwork dynamics, experiential approach, change-oriented approach and team coaching.*

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### 1. Introduction

The École Polytechnique de Montréal has integrated a teamwork approach into its twelve bachelor's engineering programs. After taking a compulsory 45-hour course on teamwork, students receive team coaching throughout the four-year program, alongside all integrated engineering projects. In these integrated projects, students generally work in teams over a semester to design an engineering project.

During these projects (one per year), a group communication specialist meets with every team for approximately 60 minutes. This process enables students to apply the knowledge acquired in the teamwork course to their projects and helps identify the group processes at play in their teamwork dynamics. These meetings encourage team members to explain their work method, internal organization and decision-making process, as well as to give feedback with the objective of finding solutions and taking action. The specialist who accompanies each team acts as a mentor.

### 2. Collaborative teamwork and interpersonal skills course

The collaborative teamwork and interpersonal skills course is a compulsory 45-hour course given to first-year undergraduate students in all engineering disciplines. This course helps students develop skills they can apply when working in teams on integrated projects. In essence, the content covers communication, perception, interpretation, active listening, feedback, emotional intelligence, conflict management, group dynamics, the organization of work, roles, norms, leadership and group cohesion (Homans 1950; Moreno 1960; Bormann 1975; Tuckman 1977; St-Arnaud 1978; Myers and Myers 1980; Winkin 1981; Bohm, Factor and Garrett 1991; Anzieu and Martin 1994; Bohm and Nichol 1996; Hirokawa and Poole 1996; Arrow, McGrath and Berdahl 2000; Ashkanasy and Daus 2002; Bennett-Goleman 2002; Cormier 2004; Kourilsky-Belliard 2004; Caruso and Salovey 2004; Mongeau

and Tremblay 2005; Wind and Crook 2005; Boyatzis and McKee 2006; Saint-Charles and Mongeau 2006; Weisinger 2006; Newberg and Waldman 2006; Frith 2007; Landry 2007; Snowden and Boone 2007; LittleJohn and Foss 2008 and Goleman 2009).

This Polytechnique course is unique in that it is taught by communication experts specialized in social and human relations (social psychologists), and in that it uses a unique pedagogic approach. The course employs active learning pedagogies (quizzes, creative activities, active learning assignments that focus on the team's experiences, smart games, etc.) and focuses on using students' experiences as an opportunity for learning (objective- and change-based experiential approach).

For example, to promote increased awareness, an hour and fifteen minutes of each three-hour class is devoted to practical application through scenarios, creative work, case studies, experiments, etc. After each exercise, the specialist debriefs students in order to help them and their teams understand the mistakes they made, draw conclusions and learn from their experiences. Subsequent theoretical instruction then has additional resonance, as students can refer back to actual experiences. Finally, in the last 15 minutes of the class, students or teams explore the changes they wish to make to improve interpersonal relationships or the organization of work. Students or teams set objectives and identify the new behaviours necessary to bring about the change they seek (Tolbert 1987; Prochaska, DiClemente and Norcross 1992; Miller, Duncan and Hubble 1997; Federman-Stein 2000; Fisher, Rooke and Torbert 2000; Watzlawick and Nardone 2000; Cook-Greuter 2001; DeLong and Berg 2003; Sklare 2004; Rooke and Torbert 2005).

### **3. The four-year coaching timeline**

To promote the transfer of teamwork skills and help students develop these skills, teams are coached by specialists over a four-year period while working on their integrated projects. Approximately 900 team coaching sessions of around one hour in length take place each year at the École Polytechnique.

Another unique feature of our program is that each coaching session focuses on the team's experiences as an opportunity for skill development. The specialist and team work together to analyze the team's dynamic and find ways to improve it, ultimately boosting the team's efficacy and performance.

The specialist takes a fairly directive approach during the student's first year, but gradually gives students more autonomy over time. During the first year, teams are encouraged to discuss and review how they have organized their work in order to understand why and how to opt for a collaborative approach over working in silos. Students' experiences enable this process of reflection and awareness, as first-year teams often work in silo mode in the belief that it will be faster and more effective. During the second project, the discussion continues to focus on the advantages and difficulties of collaborative work, and on norms and roles. The importance of developing cohesion within the team is also highlighted. In their third and fourth years, teams are required to analyze the strengths and weaknesses that affect their overall dynamic and to find solutions independently. The specialist coaches the teams by encouraging dialogue and sharing distinctions or observations that highlight experiences and acquired knowledge. He or she addresses team members' questions and concerns in order to clarify expectations and expand the team's possibilities for action.

In addition to these meetings, a "crisis management" service is offered to teams in difficulty. With the team, the specialist attempts to define the dynamic and relational aspects of the team's problems as clearly as possible. Together, they focus on leading the group to a good solution for better teamwork. In the crisis management context, the specialist acts as an advisor. Hence, an experiential and change-oriented approach is used throughout the learning process in order to foster students' teamwork skills.

### **4. Evaluating progress**

For the past two years, we have used a progress evaluation system to assess students' advancement over the four-year bachelor's degree program. This system is used for formative purposes during students' first projects, and for summative purposes during the final year project. It is an excellent instructional tool for teams during the first integrated projects, as it enables students to pinpoint which behaviours to adopt and which to avoid. As mentioned previously, we have already noticed that first-year teams have a very strong tendency to opt for a silo model, whereas the majority of fourth-year teams work collaboratively. The teams also become considerably better at organizing their work between the second and fourth projects.

According to the first results obtained using the progress evaluation system, first-year teams clearly underperform, while a large proportion of fourth-year teams meet or exceed expectations. Our system rates students using a four-point scale consisting of the following: exceeds expectations, meets

expectations, almost meets expectations and fails significantly to meet expectations. The assessment focuses primarily on interactions within the team (listening, ability to give and receive feedback and use of strategies for development and cohesion), on contributions to the proper functioning of the team (existence of a well-defined, common goal; effectiveness of the collaborative work method; and precise definition of tasks and roles) and on the team's progress (sound analytical skills and ability to take proper action where appropriate).

We have also noticed that fourth-year students are able to manage their teams independently, while teams that are on their first project lack experience and self-reliance. The difficulties faced by students during their first projects help drive home the importance of what they learned in the course, leading to more open, honest and introspective discussion in the third and fourth years. At times, real-world experience is necessary for students to be able to adopt certain behaviours. This is the basis of our approach, which aims to help students learn through experience and guidance.

## 5. The success of this innovative approach

It took no less than five years for this program to fully overcome the resistance it faced within Polytechnique, both from certain doubtful engineering professors and certain students. The first years were very challenging for the specialists who serve as instructors and coaches due to this strong resistance. But today, the backlash from professors and students has almost entirely disappeared. In fact, we are one of Polytechnique's most in-demand services. This year, we conducted over 900 team coaching sessions throughout the school. Specialists also offer a support service for teams experiencing difficulty and for the professors who lead projects. What's more, they regularly develop various tools, which are available to all online ([www.hpr.polymtl.ca](http://www.hpr.polymtl.ca)).

Finally, it's interesting to note that all collaborative teamwork and interpersonal skills courses now receive exceptional course evaluations. The program has also won several Méritas awards, which are given by students, as well as Polytechnique teaching awards.

The success of our innovative approach to developing teamwork skills at the École Polytechnique de Montréal is beginning to gain attention outside our institution. Our internship service has compiled our student's results in the area of teamwork from their internship evaluations last year. This data shows that to date, 100% of senior engineers who supervised our students concluded that they met or vastly exceeded their expectations for teamwork skills. Out of 22 criteria, that of "interacting in a team" received the highest scores from our respondents.

## 6. Conclusion

We developed this special approach, which is unique among engineering institutions, in order to foster true interpersonal and collaborative teamwork skills in all our students. With a 45-hour class featuring active learning pedagogies, in addition to specialists who coach integrated project teams over a period of four years, we successfully responded to the job market's demand for these skills.

For the past four years, the Canadian Engineering Accreditation Board has considered teamwork to be a quality (skill) that is important to develop in students. As mentioned previously, we evaluate students' progress in the area of teamwork during an integrated project in their final year, partially for CEAB purposes. ([www.engineerscanada.ca](http://www.engineerscanada.ca))

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## ROBOTICS AS MEANS TO INCREASE STUDENTS' STEM ATTITUDES

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### Abstract

This study examined the impact of robotics on the attitudes of primary school students towards science, technology, engineering, and mathematics (STEM). Two teaching approaches, one with and another without robotics, were designed for a teaching class module in the field of Science Education. Students completed pre- and post-tests on STEM attitudes and future career choices regarding the STEM professions. The results showed that the robotic approach led to a significantly greater impact on STEM attitudes and motivation than with the control group. In addition, results indicated that there is a slight significant change on students' future careers choices after participating in a 10-hours Science' module.

**Keywords:** *Educational robotics, education, STEM.*

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### 1. Introduction

Hitherto, the research has shown that students' attitudes may be fundamental to the understanding of the taught subjects (Siegel & Ranney 2003). Successful learning occurs when the content delivered is expressed as interesting information from students (Callison, Bundy & Thomes, 2005). Motivation is the key to achieve a higher level of academic engagement (Whitehead, 2010). Yet, finding the appropriate tools to foster the motivation to learn is a challenging endeavor, especially as the complexity of the topics rise. Nowadays, there is a lack of interest among students in issues of science, technology, engineering and mathematics (STEM), thus leading to the development of innovative tools. Educational robotics, often referred in literature as the new promising approach to improve STEM education, is perhaps the most efficient way to increase the interest of pupils in these areas (Robinson, 2005; Rogers & Portsmouth 2004). However, so far there are very few research data to examine the impact of robotics in students' attitudes and perceptions about STEM concepts (Whitehead, 2010).

In spite of this, the main purpose of this study was to determine the effects of an educational science program on levels of attitudes in science, technology, mathematics and engineering for fifth grades' students. This study compares the STEM attitudes and STEM career choices of students who participated in the robotic teaching approach with those that participate in a teaching approach without robotics. Specifically, the following research questions were addressed:

1. What is the impact of the robotics teaching approach in promoting student attitudes in science, engineering, technology and mathematics (STEM) for youth ages?

2. Is there a significant difference on students choosing STEM professional career between students taught with robotics integration method and non-robotics method?

Next section provides an overview of the literature, discussing some of the most relevant works that exploited the use of robotics to increase students' engagement and motivation in STEM-related studies.

### 2. Related work

Already in the early 1940s and 50s, the United States began working target to consolidate as a world leader in STEM (Ricks, 2006). Promoting educational and professional excellence in STEM fields has been a constant aspiration both in Europe and globally. Over the past years, various programs were developed to increase students' STEM achievement and positive attitudes from K-12 to postgraduate education. However, only some few of them assessed the initial effect that these programs have on student attitudes towards STEM subject-areas. Thomopoylos (2014) has developed and implemented a program that uses engine kits, Lego WeDo, as well as many supervisory materials and books, to enhance interest in STEM subjects. The 10 students aged 8-11 years old who participated agreed that the lesson of physics and information technology was more interesting when using robots. The same level of satisfaction from robotics programs was confirmed by 700 students enrolled in robotics courses with

duration from two to five days, made in informal environment, school trips, weekends or summer holidays (Ruiz-del-Solar & Avilés, 2004). Other researchers reported that when students play with robots, even if it is in a competitive setting, their interest towards programming and engineering grows. As Petre and Price (2004) point out after observing and interviewing students involved in robotics competitions, robotics can increase students' positive attitudes, through its ability to promote highly engaging and effective hands-on activities. Whitehead (2010) evaluated secondary school students' attitudes and interest who participated in 2-6 weeks program for technology, engineering and mathematics (TEM). The 107 students had worked with Lego mindstorms NXT package, for an analytical robotics program created by the National Robotic Educational Center (NREC). The results were not statistically significant for all items, but, overall, the differences were statistically significant in supporting the hypothesis that the use of robotics has positive impact on the views and interest to the TEM' concepts.

Although most research efforts show positive results arising from educational robotics, those could be due to the fact that a robot is a new tool for pupils and perhaps, in a longer-term intervention, it would not provide any additional contribution to pupils' attitudes. This is depicted in Nugent *et al.* (2010) research, considering a sample of 288 students participating in the robotics program and geospatial activities to evaluate attitudes and motivations towards STEM concepts. The results showed that the group who participated in the three hours program presented statistically higher scores in STEM attitudes when compared to the experimental group involved in a 40 hours program. These results indicate that the use of robots can initially excite students, but there is a possibility that such benefit will saturate over time. Another one-year research found out that there was little difference in students' attitude towards science after participation in the engineering curriculum that incorporates LEGO design challenges (Wendell & Rogers, 2013).

Furthermore, the demand for graduates in STEM fields continues to grow at a relatively fast pace. Conversely, the decreasing number of students engaging in STEM careers is a global phenomenon that has raised concerns about nations' economic future (Whitehead, 2010). Today, there are many available programs aimed at strengthening the students' enthusiasm for STEM concepts in order to increase the number of people who choose to pursue careers in these fields. Such programs are the First Lego League (FLL), Battle Bots and the contest VEX (Wendell & Rogers, 2013; Whitehead, 2010). Bonvillian (2002) state the importance in attracting young people to study and pursue careers in STEM fields as there is a need for conservation scientists and staffing professionals specialized in these areas. Giving students positive role models and interventions with specific educational programs is a mechanism for strengthening students' career choices (Ricks, 2006). Research in educational sciences shows that students' participation in an informal educational program could increase the number of students engaging in STEM college majors or careers (Ricks, 2006). Recent studies also indicate that robotic education can generate a high degree of student interest and engagement in STEM fields (Nugent *et al.*, 2010; Rogers & Portsmouth, 2004). In several occasions, the students involved in robotics activities report positive experiences after their participation. Nevertheless, this result could be likely due to the fact that most research efforts are not using a random sample since, usually, the students involved choose by themselves to attend those courses or participate in robotics competitions.

Bearing these ideas in mind, further research is needed to provide empirical evidences supporting the effectiveness of educational robotics in STEM attitudes and STEM careers. This is in line with the educational research literature, which indicates the need for more STEM driven curriculum practices in education that can enhance students' STEM attitudes.

### 3. Method

To determine the effectiveness of the teaching approaches, a pre-test/post-test quasi-experimental study group was designed. Two teaching approaches, one using robotics and one without it, were designed for a teaching class module in the field of Educational Sciences. The two teaching approaches concern the module "Light Concepts". The educational objectives of the module are common to both teaching approaches. Both groups who participated in the 10-hours program completed a pre-test prior to the beginning of the interventions, and a post-test afterwards.

To assess students' attitudes for STEM concepts, the questionnaire *Upper Elementary School Student Attitudes Toward STEM* (UESSATS), created from Friday Institute for Educational Innovation of North Carolina State University, was adopted (Friday Institute for Educational Innovation, 2012). The questionnaire consists of four validated constructs using elements of Likert scale for measuring pupils' attitudes towards science, math, engineering and technology. Additionally, the same questionnaire includes questions about the students' interest to pursue a career in STEM fields.

#### 3.1. Description of the teaching approaches

The proposed activities in both teaching approaches are tailored to overcome the challenges of teaching science concepts to primary students. For the design of activities, the researchers initially based

on the national curriculum about the “light concepts” module. “Light Concepts” is an educational module usually being taught in the fifth-grade of elementary education. Its educational goals are as follows:

- Understanding light propagation in linear way and to all dimensions;
- Understanding light’ interaction with different materials and sort them using the terms transparent, semi-transparent and opaque;
- Understanding the light phenomena, such as reflection, diffusion and absorption.

Students participating in the robotic approach had at their disposal a Lego Mindstorm NXT robot to be used as an educational tool according to the activities of the program. Activities include light sensor measurements, recordings, observations, estimating, programing the robot, testing the program and making conclusions. On the other hand, students participating in the non-robotic approach performed the same experiments using their eyes to make observations. Activities include observations, predictions, experimentation and making conclusions.

Both teaching approaches were tested under pilot study. Thirty two students participated in this procedure that gave valuable feedback to finalize the teaching activities. The purpose of pilot study was to examine the activities of the two teaching approaches and worksheets as: the students’ understanding of the activities, teaching objectives, measuring activities’ duration and to determine any difficulties.

### 3.2. Participants

The participants for the study were 96 fifth grades students that were randomly selected from 6 different Cypriot primary schools. Participants were divided into the experimental group, that followed the robotics teaching approach, and the control group, that followed the non-robotics teaching approach.

The experimental procedure had a duration of one week for each school. The 96 students who were selected were divided as follows:

- First Elementary school (16 pupils): Group 1 (Robotic Teaching Approach)
- Second Elementary school (16 pupils): Group 2 (Robotic Teaching Approach)
- Third Elementary school (16 pupils): Group 3 (Robotic Teaching Approach)
- Fourth Elementary school (16 pupils): Group 4 (Non - Robotic Teaching Approach)
- Fifth Elementary school (16 pupils): Group 5 (Non - Robotic Teaching Approach)
- Sixth Elementary school (16 pupils): Group 6 (Non - Robotic Teaching Approach)

For the herein proposed activities, the students involved in Robotic Teaching Approach have attended a 7-hour NXT programming course prior the procedure. During that course, the students assembled a robot with a built-up light sensor.

## 4. Results

This research sought to examine with a quantitative experimental procedure that considers a control group, the effect of robotics in attitudes and perceptions of students for STEM concepts. In order to identify whether there were initial differences between the groups, a t-test for independent samples was completed, with the independent variable being the teaching approach (robotics/non-robotics) and the dependent variables being student pre STEM attitudes. As shown by the results of the statistical analysis, there were no initial differences since the significance quotient was  $p < .05$ . Additionally, a t-test for independent samples was used, with the dependent variable being post STEM attitudes and independent variables both teaching approaches, in order to answer the first research question.

Results showed a statistically significant difference in average of total post STEM attitude,  $t(94) = 4.67$ ,  $p < .001$ , with students involved in robotics teaching approach have higher averages compared with students who participated in approach without robotics. The average students’ attitude of experimental group was  $92.71 \pm 10.97$  compared with the control group that was  $83.50 \pm 8.16$ . These results reinforce the positive contribution of robotics in students’ attitudes towards STEM fields. As presented, the students involved in robotics teaching approach had more positive attitudes in these areas, compared with students who did not use robotics.

To examine whether the 10-hour intervention was likely to affect attitudes to professional students’ selections a t-test were performed, comparing before and after the overall performance for students’ STEM Career Interest choices. Results showed a statistical difference  $t(95) = -3.34$ ,  $p = .001$  (Table 4.20), with the average score to be increase from  $32.17 (\pm 6.9)$  to  $36.25 (\pm 5.41)$ . Both teaching approaches related to the module “Light Concepts” positively influenced students’ perceptions and attitudes that can greatly affect their future career options. Although students at this age are still too young to choose a profession, what is important is that even a 10-hour intervention can positively reinforce their attitudes, which can evolve in future career choices related to STEM fields.

In addition, to examine the effect of two teaching approaches (robotic and non-robotic) to the career choices, a t-test for independent samples were performed, with dependent variable the post STEM Career Interest choices and independent variable the two teaching approaches. This test showed that there was no statistical difference in students’ professional choices associated with the teaching approach. Although none of the two teaching approaches outweighed, it is important that students of both

approaches had positive attitudes towards STEM professions after participating in the presented educational program. However, as it was mentioned before, students enrolled in robotics approach had more positive STEM attitudes. Beyond the potential to influence youth STEM attitudes, educational robotics also represents a unique technology to impact students' career choices. At the age of elementary, early incentives can develop predisposition towards a profession. Students' early involvement with activities related to science affect positively the attitude of people to follow a profession related with STEM fields. Nevertheless, the final professional decision requires more educational experiences and activities and, therefore, these results suggest the need for more involvement of elementary students in similar activities.

## 5. Conclusion

This study aim was to determine the effects of an educational science intervention based on robotics regarding students' attitudes toward STEM and their interest in STEM career pathways. Results of this study showed that a 10-hour robotic approach affected positively students' attitudes to STEM subjects and increased their excitement about robotics. This research provides positive evidence of the impact of robotics in students' attitudes to science, technology, engineering and mathematics. As mentioned in the literature, positively increasing attitudes and motivation of students in these areas is necessary for young people since a growing need for more engineers and skilled workers in these areas has been reported. The educational approach proposed in this study can serve as a valuable tool for schools, organizations, researchers and evaluators in STEM education as it positively contributes to students' perceptions and opinions in these areas. Furthermore, results of the presented study showed that both teaching approaches about the module "Light Concepts" attracted students into technology-related careers. However, none of the two approaches had greater impact on those choices. These results point the value of the proposed teaching activities for improving students' attitudes related STEM fields. Results also suggest that robotics is a clear vehicle to promote future interest in a STEM career. However, as with any educational material, the use of robotics cannot be seen as a catalyst for growing positive students' attitudes for STEM fields. Future research is needed to determine how the use of robotics can enhance students' attitudes and motivation to pursue a career in STEM related fields.

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## TEACHING VERBAL BEHAVIORS TO CHILDREN WITH AUTISM

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### **Abstract**

This study aims to examine the effectiveness of video modeling via smart board on teaching verbal behaviors suitable for social contexts to children with autism. Generalization to different people and other settings was also examined. Additionally, opinions of parents who have children with autism about teaching verbal behavior were collected. Participants of the study were 3 male children between 4-6 years old diagnosed with autism. The study was designed with a single subject multiple probe design across participants and experimental control was provided by inter-participant replication. Findings of the study show that percentages of correct responses of the participants gradually increased and the participants met the criterion of 100% correct responses at running three daily probe sessions. Besides, it was observed at follow-up sessions arranged by researchers that the participants maintained the target skills for 6 weeks. Additionally, the participants generalized the target skills to different people and settings at the level of 100% after the instruction sessions were completed.

**Keywords:** *Autism, Social Behaviors, Verbal Behavior, Video Modelling, Smart Board.*

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# UNIVERSAL INSTRUCTIONAL DESIGN FOR ACCESSIBILITY AND INCLUSIVITY: SUPPORTING LEARNERS WITH CHALLENGES

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## Abstract

This paper describes foundational principles of universal instructional design (UID), which is also known as Universal Design for Learning, that support accessibility and inclusivity, and discusses how to support a variety of learners through applying UID strategies when creating learning materials. Given that creating instructional materials that are accessible and inclusive is a relatively new challenge, it is likely that few know how to design for accessibility and inclusivity.

In an ideal world, all learners should have their learning needs met. From a practical perspective, this is not possible. However, instructional materials can be designed to be accessible and instructionally effective for a wide range of learners. This can be partially achieved by following Gagné's Nine Events of Instruction because it supports all learners. Instructional design strategies should support weak readers, deaf and hard of hearing individuals, students with visual deficiencies, learners who have difficulties staying focussed, academically-weak students, cognitively-gifted students, learners with low confidence, students with different learning preferences, and cultural minorities. These concepts will be illustrated through practical examples created for a "soldering project" that taught piping students how to solder copper pipe.

**Keywords:** *Universal instructional design, accessibility, inclusivity, universal design for learning.*

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## 1. Introduction

To thrive as a learner, students with disabilities particularly need their instructional materials to be designed in ways that specifically help them learn given their limitations. This paper discusses instructional design principles that support all learners and foundational principles of universal instructional design (UID), which is also referred to as universal design for learning, that support accessibility and inclusivity so that the instructional materials created enable a variety of individuals to effectively learn.

Ideally, everyone should be able to learn in ways that match their needs. Due to costs, we need to design materials that reach a broad range of learners. Fortunately, accessible and instructionally effective learning materials can be designed in ways that suit most learners, particularly if Gagné's Nine Events of Instruction are followed. Much can be done to support weak readers, deaf and hard of hearing individuals, students with visual deficiencies, learners who have difficulties staying focussed, academically-weak students, cognitively-gifted students, learners with low confidence, students with different learning preferences, and cultural minorities. Strategies that support learners will be elucidated through practical examples created for a project that taught piping students how to solder copper pipe.

## 2. Gagné's Nine Events of Instruction

To support all learners, base educational materials on principles of instructional design and follow a model such as Gagné's Nine Events of Instruction. Gagné's Nine Events of Instruction are gaining attention, informing the learner of the learning outcome, stimulating recall of prerequisites, presenting the material, providing learning guidance, eliciting the performance, providing feedback, assessing performance, and enhancing retention and transfer (Gagné, Briggs, and Wagner, 1988).

## **2.1. Gaining attention**

The purpose of gaining the learners' attention is to get them involved and motivated. As well, it is important to maintain a learner's attention throughout the learning materials (Fenrich, 2015; Gagné et al., 1988). According to Fenrich (2014), some of the many techniques for gaining and maintaining a learner's attention include stating something interesting, making the materials highly interactive, asking questions that require deep thinking, providing challenging content, including a variety of learning activities, and stating why the material is important.

For the soldering project, a PowerPoint™ was created. Within the PowerPoint™ attention was gained and maintained through initially showing a video of the whole process that the students would learn about, frequent questions that made the students think, discussing consequences of not following safety precautions, and using a variety of media.

## **2.2. Informing the learner of the learning outcome**

Informing learners of the learning outcome, helps them to focus their efforts on what is important (Fenrich, 2015).

For the soldering project, the learning outcomes for the entire module were stated on a slide. Each learning outcome was restated when that content was to be taught.

## **2.3. Stimulating recall of prerequisites**

Stimulating the recall of prerequisites helps to prepare students for their learning experience (Gagné et al., 1988; Rosenshine, 2012). For many skills, foundational knowledge is needed for learning higher-level thinking skills (Fenrich, 2015).

For the soldering project, students were prompted to answer questions regarding their knowledge and experience with soldering.

## **2.4. Presenting the material**

Numerous principles influence the design of effective learning materials. Base the amount of content presented in a lesson on the difficulty of the material, learners' age and attention span, and time needed to effectively address each instructional event. To help ensure learner success and increase the learner's confidence, present the material in small incremental steps so that the difficulty level gradually increases (Fenrich, 2015; Gagné, et al., 1988; Rosenshine, 2012). Generate interest by providing varied instructional strategies and activities that directly support the learning outcomes (Fenrich, 2015). Learners should be actively engaged in their learning (Fenrich, 2015; Gagné et al., 1988). The instructional strategy must direct learners to particularly focus on concepts that require higher-order thinking skills (Wu, 2009). To learn higher-order thinking skills, learners must engage in activities that require higher-order thinking (Fenrich, 2015). Lessons need to be engaging through student participation and students having opportunities to learn with others.

For the soldering project, the whole process was broken down the into several topics for easier assimilation and retention of the material. Within each topic, each individual step was discussed. Many questions were presented to keep the learner engaged. Some questions were based on photographs, others on video clips. Think-pair-share activities were included so that the students would engage with each other.

## **2.5. Providing learning guidance**

Learning guidance should be designed to help each student store knowledge into long-term memory in a way that enables the student to retrieve the knowledge later (Fenrich, 2015; Gagné et al., 1988; Rosenshine, 2012). Learning guidance is often combined with the "Presenting the material", "Eliciting the performance", and "Providing feedback" events (Fenrich, 2015).

For the soldering project, the students were encouraged to ask questions throughout both the theory and practical components. Text and numerous video clips and photographs helped learners store knowledge in different ways. The learners were also provided with samples of the project they would later construct. The quality of the soldered joints ranged from excellent to poor. The students evaluated the quality of the soldering based on the marking criteria that would be used for their own assignments.

## **2.6. Eliciting the performance and Providing feedback**

Through eliciting the performance and providing feedback, learners find out how well they are doing and how they can improve. This is important because most students do not fully learn skills without practice and feedback. Two strategies are asking questions and letting students practice the skill where each is followed by detailed feedback. Questions and practice should be at the highest required thinking level and asked throughout the learning rather than massed together, such as at the end of the instructional materials. Eliciting the performance and providing elaborative feedback are typically integrated together

so that students can immediately see and understand consequences of their actions (Fenrich, 2015; Gagné et al., 1988; Rosenshine, 2012). With respect to feedback, students are more likely to succeed when there are numerous opportunities for feedback, elaborative feedback is provided that explains why the answer is right and why other answers are wrong, and the feedback is given in a respectful way (Fenrich, 2014).

For the soldering project, elaborative feedback was provided for each of the numerous questions in the presentation. Feedback was also provided while the students worked on their practical assignments. When finished, students received additional feedback and were able to make changes.

### **2.7. Assessing performance**

Formally test learners in the assessing performance event. All of the learning outcomes and only the learning outcomes should be tested. Test performance should be criterion-referenced rather than being normative-referenced (Gagné et al., 1988).

For the soldering project, students were provided with simple and clear marking criteria, prior to beginning the practical project, that they could use as a guide in their practical performance.

### **2.8. Enhancing retention and transfer**

By enhancing retention and transfer, students are supported in retaining the information and transferring the skills beyond what was specifically taught. Retention can be supported through the instructor and/or students reviewing and/or summarizing the material. Deliberately address the transfer of skills to enhance the likelihood of transfer through, for example, providing real-life, novel, and/or varied problems and solutions. Transfer is more likely as the amount of practice and feedback increases and if the skills measured are of the near transfer type (Fenrich, 2015; Gagné et al., 1988).

For the soldering project, students completed three projects of increasing complexity.

## **3. Principles of universal instructional design (UID)**

Learning materials should be designed to be welcoming and inclusive, support accessibility for all individuals, enable flexible ways to participate in a class, ensure that the learning outcomes, presented content, and assessment are aligned, have instructional strategies that help individuals effectively learn, and not require non-essential physical requirements (Coolidge, Doner, and Robertson, 2015).

Foundational UID principles aim to provide multiple ways for a learner to be engaged, acquire information, and demonstrate knowledge. Through UID (and accommodations), all learners should have their learning needs met. Ultimately, UID leads to the creation of instructional materials that make learning accessible to a wide range of learners. Fortunately, what is done to support all individuals and some challenges is often helpful in supporting other challenges (Coolidge et al., 2015).

### **3.1. Supporting Weak Readers**

Weak readers are supported when the content contains clear and concise language, simpler word choices, short sentences, the active voice and not the passive voice, and visuals such as tables, graphs, and charts. As well, the content should only focus on what is needed (Fenrich, 2014).

This was foundational within the design of the soldering project.

### **3.2. Supporting Deaf and Hard of Hearing Students**

Deaf and hard of hearing students may need non-oral-intensive lectures, extra time allotted for group work with hearing peers, a reasonable pace (e.g., for interpreters to keep up), detailed notes as it can be hard to focus on an interpreter or instructor while taking notes, captioned video and audio clips, and the same recommendations as those for weak readers (Cawthorn, 2015).

For the soldering project, captions were added to the video clips. Students viewed either the captioned or non-captioned versions.

### **3.3. Supporting Students with Visual Deficiencies**

Students with visual deficiencies can be supported if they receive digital versions of all materials, instructors verbalize as they write or draw, materials have high contrast colours, materials are presented on a plain background, they can record lessons, and they receive described media (Rao et al., 2015).

For the soldering project, the PowerPoint™ had high contrast colours and large font sizes that met the “Web Content Accessibility Guidelines” of the World Wide Web Consortium. As well, descriptions were added to the video and photographs. Students viewed either the described or non-described versions.

### **3.4. Supporting Students who have Difficulties Staying Focused**

Students who have difficulties staying focused can be supported by providing more things to focus their attention on, such as more interactions or questions, with varied activities, including movement in the class, with cues (e.g., “It is important to note that...”, “The key points to remember are...”), by instructors modulating their voice and being animated, and giving short breaks (Rao et al., 2015).

For the soldering project, numerous questions were asked, key points were emphasized, and there were varied activities, such as the PowerPoint presentation, samples to assess, and practical assignments.

### **3.5. Supporting Academically Weak Students**

Students who are academically weak should be given time to think (e.g., with a 5 to 10 second pause after a more difficult question is asked), be given breaks to catch up, participate in think-pair-share activities and group work, only be asked to answer a question that they have a reasonable chance to get right, be provided with varied ways to learn the materials, be presented with a variety of media, only be given content that addresses the learning outcomes, and receive the same considerations as for weak readers (Kennedy, Thomas, Meyer, Alves, and Lloyd, 2014).

Given that in adults, short-term memory (STM) has a general capacity of seven pieces of information and information tends to only remain in STM for about 20 seconds, unless one focusses on the information, it is essential to help all learners and particularly academically-weak learners move information from STM into long-term memory (LTM) in a way that the information can later be retrieved from LTM. To help learners focus on the information in their STM, the learning materials should highlight important content. This can be done through expressions such as, “This is important ...”, or “It is critical to remember ...”, or highlighting techniques such as bold text or putting text in a box (Fenrich, 2014).

To help students file information into their LTM so they can retrieve it later, the materials should link new information to something they already know (for example through stating similarities and differences), model an expert’s thinking strategies, provide many practice and feedback opportunities where less practice more often is better than more practice less often, give elaborative feedback, have students do one or more things with the information, provide memory devices, minimize rote memorization, provide examples and non-examples, use the disequilibrium technique where students are presented with an anomaly to a concept or something that is untrue about a concept, enable learners to focus on one thing at a time because multi-tasking is not truly possible, present information in a logical order, organize information (e.g., headings, sub-headings, and tables), provide meaningful and relevant content, not overwhelm learners with details, provide memory devices, chunk information into manageable bits (e.g., a few related steps at a time), address mistakes learners typically make, and review and/or summarize or request students to review and/or summarize the content (Fenrich, 2014).

For the soldering project, the content was broken down into manageable chunks, videos of common mistakes were shown, the two techniques for joining metals were linked to each other, feedback was given throughout, and summaries highlighted key points both within and at the end of lessons. As well, a combination of video, photographs, and text supported the learners. The PowerPoint™ was made accessible to the learners prior to and after the lesson.

### **3.6. Supporting Academically Gifted Students**

Academically-gifted students can be supported by asking higher-order thinking questions, providing extra/voluntary activities that are challenging, providing additional resources to learn the content to a higher level, encouraging creativity, giving flexibility in how they can demonstrate knowledge, and enabling them to support other students (Hockett, 2009).

For the soldering project, students were encouraged to support each other.

### **3.7. Supporting Students with Low Confidence**

Instructors can support students with low confidence by giving them time to think (e.g., by pausing after asking a question and, as needed, asking some students to not call out answers and to wait to give everyone time to think), asking them questions that they will likely get right but are not so trivial that it could insult them, including think-pair-share activities, beginning exams with easier questions, providing positive constructive feedback, interacting with them as you would all students (which also applies to students with other challenges.), and having confidence in them (Kennedy et al., 2014).

For the soldering project, the instructors were encouraged to pause after questions, the material was presented in manageable chunks, and think-pair-share activities were provided. The PowerPoint™ was made accessible to the learners prior to and after the lesson.

### 3.8. Supporting Different Learning Preferences

Two underlying principles for supporting different learning preferences are:

1. Each student should sometimes be taught in a way that he or she prefers.
2. There is no single teaching method or medium that is perfect for all learners!

To support varied learning preferences have students explain concepts, provide varied activities, provide numerous interactions, use different questioning techniques, include experiential learning, include a variety of media, and have both individual and group activities. Through a variety of techniques, each student is more likely to sometimes experience a technique that they particularly enjoy. As well, assessment activities tend to support teaching excellence and diversity when the assessments only measure the learning outcomes, assessment activities parallel the level of difficulty of the learning outcomes, learners have varied ways to show that they have learned the skills, there are both informal and formal assessments, and there are numerous opportunities for feedback (Fenrich, 2014, Rao et al., 2015).

For the soldering project, as discussed, there were varied activities such as the theoretical and practical components, assessing existing products, and a final water pressure test, video, photographs, and text were used, there was individual work, some discussions in pairs, and class discussions, there were both informal and formal assessments based on the learning outcomes, and feedback was provided throughout.

### 3.9. Supporting Cultural Minorities

To support cultural minorities provide some examples/case studies from around the world, be gender neutral, use names from around the world, and use images from around the world. Some images should be of individuals with disabilities (Higbee, Schultz, and Goff, 2010).

For the soldering project, there were no opportunities to specifically address this.

## 4. Summary

Instructional materials can be designed to support accessibility and inclusivity. In general, designing materials based on Gagné's Nine Events of Instruction supports all learners. Among the numerous instructional strategies, lessons should be engaging, include a variety of interactive techniques, help students focus on content and file information into their long-term memory so they can retrieve it later, include informal and formal assessments, provide numerous opportunities for feedback, provide elaborative feedback, and factor in ways to minimize the impact of challenges that students have.

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## UNPACKING THE EXPERIENCES OF TEACHERS TRANSITIONING TO BLENDED LEARNING IN TRINIDAD AND TOBAGO

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### Abstract

This case study explored the perspectives of 68 part-time in-service primary school teachers enrolled in a 12-week blended learning mathematics education course in their first year of a Bachelor of Education at a university in Trinidad and Tobago. The study sought to identify factors that hindered or facilitated participants' learning, and factors that would have scaffolded their transition to the blended learning environment. Data were collected from participants' journals, researcher's observations of face-to-face and online activities, and focus group interviews. Data were analysed using qualitative content analysis. Learning was facilitated by participants' interaction with technology that provided opportunities to develop competencies with it, and forge collaborative relationships in shared virtual spaces; flexibility of time and space for online activities; and supplemental support of online resources and activities. Challenges included simultaneously learning to navigate the virtual world and learning new content; limited previous exposure and access to computers and the Internet; managing the time to attend to online activities; the absence of immediate technical support for difficulties arising; and loneliness created by the absence of face-to-face interactions. Participants felt that the transition to the blended environment would have been better facilitated by an extended orientation period; a student manual to navigate the course shell; access to 24-hour technical support; and guidance on managing their time during the course. Future research requires large-scale analysis across all learning activities in any blended learning course to identify a comprehensive list of factors that influence the transition to blended learning.

**Keywords:** *Blended learning, mathematics education, in-service elementary teachers.*

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### 1. Introduction

Higher education institutions must design programmes that are widely accessible, convenient, and appealing to an increasingly diverse adult-student population (Dorrian & Wache, 2009). Blended learning (BL) is a novel approach to programme design and delivery that mitigates this challenge by integrating ICT into teaching and learning to complement traditional face-to-face (FTF) approaches (Garrison & Kanuka, 2004). BL is more than integrating technology in FTF courses to supplement course content, or provide supplemental resources on a dedicated website to replace classroom time, or replace FTF courses with entirely online courses (Dziuban, Hartman, & Moskal, 2004). Dziuban, et al. (2004) described a mixed-mode BL course that combines FTF classes with online activities, reducing FTF sessions and replacing them with online or offline activities. This approach integrates synchronous and asynchronous online activities (Goeman & Van Laer, 2012) that facilitate additional interaction among students and faculty, with course content inside and outside the classroom through any Internet connection. Thus, BL courses should meaningfully combine the best of FTF and online learning, and reduced time spent in the physical classroom without compromising good teaching and learning.

BL has been embraced by scholars and practitioners in many education contexts, but it remains a novel approach in Trinidad and Tobago. The paucity of research about students' experiences (Sharpe & Benfield, 2005) in BL in higher education in the Trinidad and Tobago context is apparent. Ginns & Ellis (2007) highlighted the need for faculty to understand students' perspectives on their technical skills and ability to navigate online materials and activities across a BL course, to determine the success of the BL environment in supporting student learning. Hence, in this case study I interrogate part-time in-service teachers' experiences of a redesigned blended course at a university in the Trinidad and Tobago context.

## 2. Literature Review

BL is an approach that convergences “two historically separate models of teaching and learning: traditional FTF learning systems and distributed learning systems” (Graham, 2006, p. 5). It emphasises the role of combining multiple complementary instructional media in promoting meaningful learning. This review explores factors that hinder and facilitate learning in the BL environment.

BL courses allow faculty to provide additional content and activities and increase interaction with students in a virtual space that that serves as a repository for supplemental material that participants can access (Makhdoom, Khoshhal, Algaidi, Heissam, & Zolaly, 2013), a benefit that traditional FTF classes may not accommodate (Garnham & Kaleta, 2002; Snodin, 2013). They may increase the quantity and quality of participants’ contribution to online and offline activities (Snodin, 2013) because they can reflect on and revise their contributions before sharing with others online (Chen & Chiu, 2008; Rix, 2011); this may otherwise not occur in FTF interactions if some participants monopolise talk time. Developing this reflective stance may also embolden some participants to contribute more during FTF activities (Rix, 2011). They enhance active and self-directed student learning (Wu, Tennyson, Hsia, & Liao, 2008), and facilitate the development of autonomous learning behaviours as participants set their own goals, select course material that match their interests and needs, and select what they will share with others (Snodin, 2013). They provide students the flexibility and convenience of learning at their own pace and on their own time without the challenge of the commute to and from classes (Makhdoom, et al., 2013; Smyth, Houghton, Cooney, & Casey, 2012; Wu, et al., 2008). They promote collaborative learning (Snodin, 2013), and create social presence that is critical for promoting feelings of belonging to a community of learners and connectedness among participants (So & Brush, 2007). In BL courses that contain a reflective component, participants develop their metacognition when they reflect on their personal experiences and thoughts (Snodin, 2013). Overall, BL “requires confidence in learning, choosing familiar ground, being prepared to be open...and working together in a safe and supported situation with both FTF and online support” (Greener, 2008, p. 2).

Despite the positive aspects of BL, there are some barriers that hinder student success. BL courses require participants to have ready access to technology tools and the Internet, the ability to engage in online activities, and to manage frustration generated when technical difficulties arise (Bonk, Olson, Wisher, & Orvis, 2002; Vaughan, 2007). Frustration is heightened in the absence of timely support to overcome technical difficulties (Smyth et al., 2012), particularly for novice users of BL, and some participants turn to their tutors for assistance (Welker & Berardino, 2015). Online components of BL courses are devoid of physical interactions among participants, which create a sense of isolation from other course participants (Bonk, et al., 2002; Wu et al., 2008) or reduced interest in the course (Makhdoom, et al., 2013; Smyth et al., 2012). Additionally, BL courses appear to demand more time for engaging in learning than traditional face-to-face courses (McVeigh, 2009), and participants find it difficult to manage their time for completing online activities between FTF classes (Vaughan, 2007). BL courses also require participants to manage their physical space as well, and sometimes to negotiate with others for access to shared home space to complete activities, and may require participants to pay for home internet access (Holley & Oliver, 2009), or upgrade their current access for a faster connection.

## 3. Methods

### 3.1. Research Objectives

The study sought to explore participants’ experiences of a BL mathematics course to identify factors that hindered or facilitated participants’ learning, and factors that would have scaffolded their transition to the blended learning environment.

### 3.2. Research Design

This descriptive case study was undertaken at a university in Trinidad and Tobago, and involved students enrolled in a BL mathematics course offered in the second semester of their first year.

### 3.3. Sampling and Participants

Participants in the study were all 68 part-time in-service primary school teachers (52 female and 16 male) enrolled in the blended course. They ranged in age from 25 years to 54 years, and in teaching experience from 5 years to 29 years. They all provided informed consent regarding their participation.

### 3.4. Research Context

Students in their first year of a Bachelor of Education degree at a university in Trinidad and Tobago are required to take a compulsory entry-level mathematics education course in the second semester. This course exposes students to principles of mathematical thinking and problem solving in five

strands of mathematics: number, measurement, geometry, algebra, and statistics. In 2013 the university adopted BL across all of its programmes. This course was redesigning according to Dziuban, et al.'s (2004) mixed-mode instructional model, and incorporated Carman's (2005) five critical elements: (1) synchronous, instructor-led learning activities in which all learners participate simultaneously via a video conferencing tool; (2) self-paced learning activities for individual completion located on a course shell; (3) a collaborative environment for participants to interact with each other via discussion forums, video conferencing, and email; (4) supplemental material to enhance retention and transfer of learning via downloadable resources, and links to websites and related resources located on the course shell; and (5) assessments and rubrics located on the course shell.

The 12-week blended course was offered over seven 3-hour FTF sessions, and online activities equivalent to five 3-hour sessions. The researcher was the course lecturer, and was trained to use the Moodle platform and video conferencing tool for the course. In Week 1, participants were introduced to the course, and oriented to the course shell and video conferencing tool. Over the following 11 weeks participants attended six FTF sessions and five online sessions in alternating weeks. During FTF sessions participants engaged in small-group and whole-group activities as they explored mathematical concepts, structures, and procedures using concrete and virtual manipulatives, and explored the embeddedness of these mathematical ideas in their natural world. They reflected on how they would communicate these mathematical ideas to their students. During online activities, participants and the researcher engaged in synchronous class discussions through a video conferencing tool; the course shell provided participants' access to asynchronous online quizzes, discussion forums, journal, and email. The researcher uploaded all course materials and resources to the course shell weekly. Assessments focused on mathematical thinking and problem solving, and comprised an essay on developing mathematical habits of mind; problem solving in algebra and geometry; a small-group mini empirical research using basic statistical procedures; a small-group project involving designing and creating a model for a bedroom using measurement and geometrical shapes and relationships; an online quiz relating to number; and an online discussion relating to mathematical modelling.

### **3.5. Data Collection and Analysis**

Data were collected from participants' online journals; the researcher's observational notes about participants' interactions during FTF and online activities; participants' journals about their experiences in the BL course; and 45-minute semi-structured focus group interviews with two groups of six randomly selected participants (after final grades were posted). The interviews focused on participants' experiences with the BL approach to identify what they considered hindered or facilitated their learning, and scaffolds needed to support their transition to the BL environment. The interviews were audio recorded and later transcribed for analysis. All data were analysed using qualitative content analysis "for the subjective interpretation ... through the systematic classification process of coding and identifying themes" (Hsieh & Shannon, 2005, p. 1278).

## **4. Findings and Discussion**

The findings of this study contribute to researcher's understanding of students' experiences of a BL course. Analysis of participants' experiences focused on three categories: facilitators in the BL environment; hindrances in the BL environment; and scaffolds for the transition to BL.

### **4.1. Facilitators in the BL environment**

For many participants, the course was their first exposure to BL, and they valued the opportunity to interact with novel approach to technology use. It facilitated their developing competencies with the technology tools and manoeuvring the BL environment, and using the tools to communicate with their classmates and lecturer (Snodin, 2013). They eventually became more self-efficacious with the tools (Greener, 2008), and began to integrate the technology into their daily routine, like checking email when they logged on, using video conferencing for personal communication, and investing in smart phones for easy access to technology. By the end of the course, participants had become more skilled with computer use and were better able to cope with their emotions when they experienced technical difficulties. The shared virtual learning space for collaborating and exchanging ideas with classmates and the lecturer created a welcoming learning community; the online communication strengthened budding relationships with classmates and lecturer (Makhdoom, et al., 2013; Vaughan, 2007), which facilitated learning outside of the classroom. Some participants were happy that the discussion forums permitted them to reflect on discussion topics and produce measured and thoughtful responses (Chen & Chiu, 2008; Rix, 2011), which helped develop their communicative competence, and encouraged them to participate in online and classroom discussions more (Rix, 2011). All participants valued the time and space flexibility afforded by online activities (Makhdoom, et al., 2013; Smyth, et al., 2012; Vaughan, 2007; Wu, et al., 2008), which permitted them to get home after school with sufficient time to attend to family commitments. They

welcomed the centrality and accessibility of supplemental material provided by the lecturer on the course shell supported their learning outside of the classroom (Makhdoom, et al., 2013), so they learned more and achieved some autonomy over their learning (Smyth, et al., 2012). Participants appreciated the online journal, which encouraged reflection and introspection, and provided a private space to share their thoughts and feelings with the lecturer (Snodin, 2013).

#### **4.2. Hindrances in the BL environment**

A major challenge participants identified was their unfamiliarity with the blended environment, and for some, with computer technology (Vaughan, 2007). Some participants did not have a computer or Internet access at home prior to enrolling in the programme, and had to purchase Internet time and a computer for the course (Holley & Oliver, 2009), or use computers in the university's library or relatives' homes. This problem of access during synchronous online sessions required them to be on campus rather than at home. Additional frustrations surrounded participants having to simultaneously learn new course content and navigating the virtual world using ICT. Additionally, when they experienced technical difficulties during synchronous and asynchronous activities, they became frustrated that they had to wait three days for technical assistance (Smyth et al., 2012; Welker & Berardino, 2005). They often consulted the lecturer when difficulties arose (Welker & Berardino, 2005), but her assistance was limited. Managing their time to balance online activities and their personal commitments was also challenging; they opined that the BL course required much more time than any FTF course they had experienced (McVeigh, 2009; Smyth, et al., 2012). Thus, they found it difficult to prioritise their 'school work' over family time during their off-campus days, even though they attempted to stick to the lecture timetable (McVeigh, 2009; Smyth, et al., 2012; Vaughan, 2007); some of them procrastinated over task completion and contributed to asynchronous activities quite late (Lim, 2002). Some participants felt isolated from classmates because of the reduced physical contact time (Makhdoom, et al., 2013; Smyth, et al., 2012).

#### **4.3. Scaffolds for the Transition to the BL environment**

Participants felt that the transition to the blended environment would have been less challenging if their technology competencies had been assessed prior to the start of the course (McVeigh, 2009), and they had an extended period of orientation to the use of the Moodle platform prior to the start of the course. They suggested that the university should strongly encourage students to ensure a reliable broadband Internet connection when they register for BL courses (Smyth, et al., 2012), and to develop their computer competencies (Wu, Tennyson, & Hsia, 2010). They suggested that a student manual to navigate the Moodle platform should be created and made accessible to them to provide them with a ready resource. They suggested that a 24-hour help-desk for technical support would reduce students' frustration when they experienced technical difficulties.

### **5. Conclusion and Future Directions**

This study explored the experiences of part-time in-service primary school teachers enrolled in a BL mathematics education course. Its findings confirmed that participants experienced obstacles and facilitators or successful learning in the BL environment, and provided insights into additional scaffolds for learning in the BL environment. However, there were a number of limitations of this study, but they are instructive of future directions in BL research in Trinidad and Tobago. First, the study engaged a small group of participants enrolled in one BL courses at a single university, in a country with numerous higher education institutions; thus, the findings are not generalisable to the entire population of higher education students enrolled in BL courses across Trinidad and Tobago. However, this provides the opportunity to expand the research to other courses to broaden the sample for more rich data. Second, the researcher was the course lecturer, which could have introduced some degree of researcher bias and interfered with students' journal entries and responses during interviews. Future BL research should engage neutral collaborators to assist with data collection and analysis to improve the validity of findings. Third, these findings are not exhaustive, and further research requires large-scale analysis across all learning activities in any BL course (Lust, Juarez Collazo, Elen, & Clarebout, 2012) to unearth a more comprehensive list of factors that influence the transition to blended learning.

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## **EFFECTIVENESS OF THE MULTIDIMENSIONAL CURRICULUM MODEL IN DEVELOPING HIGH ORDER THINKING SKILLS IN ELEMENTARY AND SECONDARY STUDENTS**

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### **Abstract**

The study aimed to assess the effectiveness of the Multidimensional Curriculum Model (MdCM) in the development of high order thinking skills in a sample of 394 elementary and secondary school students in Israel. The study employed a quantitative quasi-experimental pre-post design, using a study module based on MdCM, comparing intervention group to control group. Thinking skills were measured using a thinking questionnaire comprising 3 dimensions: Scientific thinking- focusing on inquiry skills, creative thinking – relating to problem finding and problem solving, and future thinking- concerning personal and time perspectives. Findings indicate improvement in measured thinking skills in the intervention group by 40% compared to 4 % in control group. Most improved skills were future thinking and creative thinking. Differences were detected according to type of school. It is suggested that when used regularly the MdCM incorporating innovative teaching-learning strategies and embedded thinking tools could improve thinking skills among students from different age groups. General implications for curriculum design are discussed.

**Keywords:** *High order thinking, curriculum design, 21<sup>st</sup> century skills, future thinking, innovative teaching strategies.*

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## MARKING FOR THE MASSES WHEN TIMELY FEEDBACK IS IMPORTANT

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### Abstract

The popularity of Computing degrees in the UK has been increasing significantly over the past number of years. However, this is tainted as Computer Science degrees also continue to maintain the highest dropout rates. In Queen's University Belfast (QUB), we currently have a Level 1 intake of over 400 students across several computing pathways. Our drive as staff is to empower and motivate the students to fully engage with the course content and all students take a Java programming module the aim of which is to provide an understanding of the basic principles of object-oriented design.

To assess these skills, we have developed Jigsaw Java as an innovative assessment tool offering intelligent, semi-supervised automated marking of code. For many of the students this is the first time they will have tried to program and therefore instilling a passion and interest is paramount if they are to be successful in their studies. One of the main issues we have had is that using the Java compiler can be as demotivating as not understanding programming. Coupled with this is the fact that if all students, in a large class, submit code to be manually marked and returned with useful feedback the process takes too long, it requires multiple markers which increases inconsistency of the process. If the students are lost at the point of submission of this task, by the time feedback is returned they have missed too much content to catch up and they become very demotivated.

Jigsaw Java allows students to answer programming questions using a drag-and-drop interface to place code fragments into position. Their answer is compared to the sample solution and if it matches, marks are allocated accordingly. However, if a match is not found then the corresponding code is executed using sample data to determine if its logic is acceptable. If it is, the solution is flagged to be checked by staff and if satisfactory is saved as an alternative solution. This means that appropriate marks can be allocated and should another student have submitted the same placement of code fragments this does not need to be executed or checked again. Rather the system now knows how to assess it.

Jigsaw Java is also able to consider partial marks dependent on code placement and will "learn" over time. Given the number of students, Jigsaw Java will improve the consistency and timeliness of marking.

*Keywords: Programming, assessment, automated marking, personalised feedback, large class teaching.*

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### 1. Introduction

University Computer Science departments throughout the UK are experiencing high drop-out and failure rates among first year students (Simon, Esper, Porter, & Cutts, 2013), with some reporting losses as high as 50% (Facey-Shaw & Golding, 2005). A lack of relevant previous computer knowledge of students applying to computing degrees coupled with their belief that attendance at lectures is not necessary for success all lead to a lack of engagement and problems with retention. This is particularly concerning as it is first year students who should be developing good study skills to endure throughout their degree program, (Butler, et al., 2015).

Students perceived previous computer experience includes advanced use of spreadsheet and database software but very limited knowledge of computer programming. Technology is now a central part of everyday life with a result that students believe a computing course will be "easy". The misconceptions lead to problems for first year students who must come to terms with an inherently difficult concept to understand alongside the transition from school to higher education, which itself is continually evolving. For example, education provision through online mechanisms has changed how students engage with course content. It is no longer the case that students must attend class to obtain information as it is already available and therefore face-to-face attendance is diminishing (Butler, et al., 2015).

Within Queen's University Belfast (QUB) another factor which leads to falling attendance and a lack of engagement is that of large class sizes as the student believes they become invisible. In a small module of 30 or 40 students the lecturer would notice if a student was missing however increase the class

size to 450 and an individual student not being present is not as noticeable (Romer, 1993). His study also found that students with full attendance compared with those who attended infrequently usually obtained a full letter grade more on completion of the course.

Three components of learning have been identified as student outputs (achievements), student inputs (skills and aspirations) and the institution environment (teaching practices), (Astin, 1970) and although defined in terms of learning has resonance with student engagement. (Fredricks, Blumenfeld, & Paris, 2004) note three dimensions for student engagement; behavioural (students' willingness to participate in academic, and other activities), cognitive (students' investment in effort to learn), affective (students' feelings towards the educational environment). The definitions for learning and engagement significantly overlap and provide frameworks to explore and define student engagement and/or learning within a specific context (Butler, et al., 2015). It is also important within this study, in terms of engagement, that scaffolded learning is considered. Scaffolded learning is not just about providing help, the idea is that students engage with content early because the support integrated within the learning events enables them to learn new skills and later complete a similar task on their own, (Gibbons, 2015).

The lack of engagement, difficulty in learning to program and high drop-out rates are not new for computing departments and have been investigated significantly over the last number of decades. However, there is still no clear solution for managing these issues. This is acceptable as there is always context and there is never a "one size fits all" solution (Gregory & Chapman, 2012). This study will consider the first of several changes which will attempt to monitor and encourage student engagement on a first-year introductory Java programming module (from this point referred to as the module) delivered to 400 computing students in QUB.

## **2. First Year Programming Module: the context of learning events**

The context of the learning events for the module is important to present at the outset of this study as it defines several points when students are expected to engage. For the last three years, QUB computer science student attendance has been automatically tracked using a student engagement management system (SEMS). The module is considered to have acceptable attendance which has been between 65% and 72%. However, in relation to learning programming for the first time simply attending a lecture is not enough, rather student engagement with the content is paramount.

The module, is led by two academics and is primarily taught through interactive lectures and practical sessions. There is a traditional, lecture slide deck made available to students through QUB's virtual learning environment (VLE). These are uploaded at the end of each week, for prior consideration by students in preparation for the following week. During the lecture, the content is delivered through live coding to practically demonstrate the theoretical concepts defined in the slide deck. The students are encouraged to bring their own laptops to class and to follow through the live coding. The lectures are recorded (screencast and audio) and made available through the VLE. This resource does not discourage lecture attendance with students reporting that they use the recordings for revision and to clarify points they are struggling with.

Despite the number of students enrolled on the module they are strongly encouraged to contact staff for support but are asked, before requesting a meeting, to review the relevant video lecture. This has reduced the number of basic questions at meetings and students come more prepared with useful questions to address the gap in their knowledge. The final element of expected student engagement during lectures is the opportunity to ask questions using an online tool. Students can ask questions anonymously which are answered either as they are asked or at the end of the lecture. The benefit of this is that as the module has progressed, students are correctly providing answers to each other. This has been very positively received from students as they get immediate clarification on points made.

Alongside the lectures are timetabled practical sessions at which attendance is again tracked. These are two-hour sessions, scheduled weekly, in a computer lab with Stage 4 and PhD student demonstrators for support. A document for each practical session is uploaded to the VLE and is designed in three parts; a step-by-step set of instructions to disseminate the theory delivered during the previous week's lectures, ten questions relating to the same theoretical concept requiring students to implement a Java solution, and a design task to encourage students to problem solve on paper or using a digital tool such as OneNote or EverNote. The current problem with this is that it would be beneficial for students to upload submissions for the second part of the practical document, to begin scaffolding their learning early in the module. However, there is not the capacity to manually mark ten questions for each student on the module and return feedback in a timely manner that would allow feedforward into the next week's lectures and practical session. This type of support would require multiple markers and would only lead to inconsistencies, inaccuracies and inefficiencies and would not provide timely feedback (Blumenstein, Green, Nguyen, & Muthukkumarasamy, 2004). An automated tool would be required to provide an appropriate level of feedback on a week by week basis.

### 3. Module Assessment

“Students will study what they think will be assessed”, (Ramsden, 1992) and this should be considered in line with Biggs’ theory of constructive alignment, which proposes an alignment of teaching and assessment. It stresses the importance of ensuring the assessment tasks mirror the desired learning outcomes, (Biggs, 1999). Traditionally, the module was assessed through unseen written examinations, disseminated only at the end of each semester. This type of assessment was deemed unsuitable to gauge proficiency of the module learning outcomes given the applied nature of programming and thus several in-term assessment points were introduced. Two assessments in first semester in week 6, worth 10%, and week 12, worth 30% and two assessments in second semester during week 8, worth 40% and week 11, worth 20%. The ethos behind this was to engage students at an earlier stage to try and build confidence in programming while keeping the summative mark low risk early in the module.

Several assessment strategies were employed including an open-book, unseen programming exam, where students are provided two hours, in exam conditions, to implement a Java program with very focussed requirements, an individual assignment and an online theory exam. The unseen programming exam is employed in week six of the first semester and covers topics such as variable declaration and initialisation, selection, repetition, methods and basic object construction. A second unseen programming exam is the assessment in week eight of second semester and covers inheritance and polymorphism. Both programming exams are marked by the two academic members of staff to retain consistency of marking and feedback. The feedback for the first practical exam is returned within two and a half weeks and time spent on marking averages 20 minutes per student. The feedback is partially a criteria mark scheme, providing the student with the core assessment principles for each part of the exam and an optional section for more detailed, individual feedback, see Figure 1.

Figure 1. Sample Feedback for Unseen Programming Exam.

**Key for the marking component**

- 0 Missing:** completely absent or nothing of value
- 1 Incomplete:** this part of the assessment has been attempted but very poorly
- 2 Below Average:** some of the elements work as expected but a lot of the functionality has been missed
- 3 Average:** the code is mostly completed to the specification however there are errors resulting in the tester not running as expected
- 4 Above Average:** the code is very close to the specification, there are only a couple of small elements missing
- 5 Excellent:** the solution provided is exactly to the specification

| Part One - 25 marks         |   | 0 | 1 | 2 | 3 | 4 | 5 |
|-----------------------------|---|---|---|---|---|---|---|
| Component                   | Comments  |   |   |   |   |   |   |
| Book class and object class | Implementation of the Book object class with the instance vars - title: String, author: String, onLoan: boolean, numTimesLoaned: int      |   |   |   |   |   | ✓ |
|                             | Implementation of the Book constructor to set four instance variables with values read in as parameters                                   |   |   |   | ✓ |   |   |
|                             | Create four mutator methods for the instance variables: setTitle, setAuthor, setLoan, setNumLoans   |   |   | ✓ |   |   |   |
|                             | Create four accessor methods for the instance variables: getTitle, getAuthor, getLoan, getNumLoans  |   |   |   |   |   | ✓ |
|                             | Creation of the LibraryTester class with a new Book object instance with the values on the paper. Print out the details as per the paper. |   | ✓ |   |   |   |   |

**Comments**

Your constructor does not assign the values of any of the passed in variables to the class instance variables. All class instance variables should be private. There should be NO main method in the Book object class and your setters are incorrect. The point of a setter is to take a passed in value and assign it the class instance variable whom the setter belongs to. I would recommend going back through the lecture notes and practicals and when the solution is covered in class if you have any questions please get in contact with one of the lecturers.

The feedback for the second programming exam takes a little longer at approximately 30-35 minutes per student. For both exams, whole cohort feedback is returned as a sample solution presented through a live coding demonstration. The was delivered in a lecture a few days following the assessment and questions answered through the interactive messaging system.

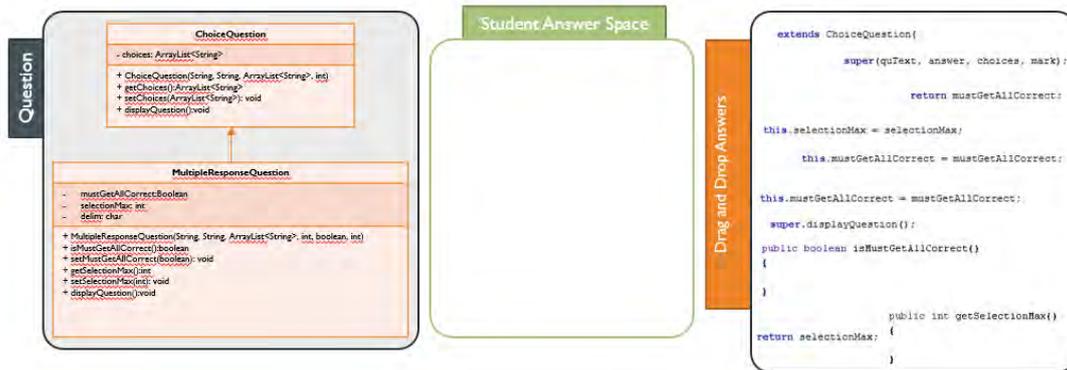
The main assignment is presented to students in the week following the first semester programming exam with a submission date in week 12. The proposed problem changes each year and allows for creative solutions to be implemented, reducing the temptation for plagiarism. Presenting it at the end of first semester results in limited possibilities for functionality and focuses on arrays or array lists. Marking is again carried out by two members of staff but does take substantially longer to mark, at 50 minutes per student. The students obtain feedback the week before the start of semester 2 in late January. This format of assessment, while taking longer to mark, is the one that provides a solid foundation for learning. The students spend a lot of time programming and debugging their own code and their confidence clearly increases as does their ability to understand and implement code.

The final online theory exam is delivered via the VLE which offers a variety of different question types e.g. multiple choice, hotspot, drag and drop, essay etc. In terms of theory and the weighting of this assessment, multiple choice questions are considered appropriate to provide the correct depth of question from assessing basic text book theory to more problem based scenarios. It was as part of this final theory exam that the decision was taken to make use of the different question types to create a pilot for a more innovative method of returning immediate feedback to students on their programming ability.

## 4. Jigsaw Java

Jigsaw Java is a bespoke tool written in C# to provide several functions but primarily to offer intelligent, semi-supervised automated marking of code. Questions along with a sample Java solutions are written in preparation for inclusion in the VLE assessment tool as drag and drop questions. Each of the Java files are read by Jigsaw Java to create image files which are then uploaded, along with the question, to the VLE assessment tool. A typical question would be to ask students to organise the Java statements to match the UML design, see Figure 2.

Figure 2. Question, drag and drop answers, assigned space in QUB VLE for students to answer.



Once students complete the assessment the “answers” are downloaded from the VLE and imported back into Jigsaw Java as a series of image names. For each image name Jigsaw Java maps this to the statement of code the image refers to and builds up a Java file. The Java file is considered as the students implemented solution and is compiled, executed (if possible) and matched to the sample solution. If it matches, then full marks are awarded however if it doesn’t completely match then Jigsaw Java performs several operations. It checks if the Java file compiles and if it does, determines if the output matches the expected output. If there is a match, then the marking process pauses for academic input, asking if the provided solution is acceptable and if so how many marks should be awarded. This solution and associated mark is saved and if this solution is identified again in the marking process Jigsaw Java knows how to automatically manage it. If the student’s submission compiles but the expected output is different, the lines of code are checked, by the tool, and depending on how many are in the correct position, partial marks (up to a maximum) are awarded. This is the same if the student’s solution does not compile except that the maximum mark is set lower.

Jigsaw Java creates feedback for each student based on the questions answered in the assessment. The feedback consists of the questions, the students submitted solution, two of the most popular completely correct solutions and the students mark. If a student has not obtained full marks then further explanation can be provided, for example, “*your code compiled but did not produce the expected results*”. The week 11, second semester online theory exam presents 34 standard multiple choice questions covering topics such as string manipulation, array lists, collections, exception handling, sorting algorithms, file input/output and JavaFX and three questions using the Jigsaw Java technology (based on the listed topics). For the pilot, only a small number of Jigsaw Java questions were set to determine student reaction and staff confidence in the provision of marking and feedback. The assessment was completed by 382 students and it was estimated that marking took just under one minute per student with feedback returned within 24 hours.

## 5. Analysis and Interpretation of Results

In terms of marking time per student, Jigsaw Java significantly reduces time spent from 50 minutes to under one minute. The topics assessed through the online theory exam were analysed and the results are shown in Table 1.

Table 1. Results of question topics.

| Topic   | Percentage of class who answered correctly |
|---|--|
| 1. String manipulation                              | 29.2%                                      |
| 2. Array Lists                                      | 48.9%                                      |
| 3. Exceptions                                       | 43.2%                                      |
| 4. JavaFX   | 58.8%                                      |
| 5. Inheritance                                      | 76%  |
| 6. File I/O (including basic database manipulation) | 68.8%                                      |
| 7. Collections                                      | 65.5%                                      |
| 8. Sorting  | 40%  |
| 9. Recursion  | 92%  |

There are a few interpretations to be discussed based on the results in Table 1. The first is that the results from topics one to three are concerning as these are fundamental programming topics covered in semester one, and students should clearly understand them by this stage of semester two. Taking topic six as it is significantly higher than the first three topics highlights problems as file I/O requires string manipulation, array lists and exceptions. Could we take from this that when theoretical questions are asked out of context, students struggle to answer them, while, placing the same theory within a real-world problem makes more sense? Or that the content of first semester is not scaffolded properly so students are unable to realise their full potential with the result that a lack of confidence in their programming ability builds quickly and academic achievement is lower. The second point regarding a lack of scaffolding does have a detrimental effect on students' ability to learn programming. Encouraging this behaviour early in a student's first year of university should help to also develop good study skills to endure throughout their degree program, (Butler, et al., 2015).

The final analysis of results was carried out on only the three Jigsaw Java questions. This analysis revealed a total of 861 different patterns of Java code across the three questions; 315 for the question on inheritance, 350 on file input/output and 196 on access to data held in a database. The reason for the lower number of patterns on the database question is due to the code being detailed in the practical the week before the assessment. This suggests that code students have most recently seen or been tested on is what they can reiterate most clearly, (Ramsden, 1992). There is a much higher number of patterns than would be expected in the first two Jigsaw questions as the code required is of relatively small quantity. The results again suggest that students are struggling with the conceptual understanding of programming and basic coding skills. Therefore, the next implementation of the pilot will consider code quality and the ability to debug as part of the scaffolding offered through feedback from the system, (Eranki & Moudgalya, 2015). This will afford the opportunity to engage with students at a very early stage in the module and will close the gap on a two-way communication. Formative feedback will be returned on a weekly basis from week three to support scaffold learning, rather than only being returned in week nine of first semester. This will offer many opportunities for student engagement covering the three principles set out by (Fredricks, Blumenfeld, & Paris, 2004), improving student behaviour, cognition and emotion towards their learning which should in turn improve engagement, retention and achievement.

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## **EMPLOYERS AS INDIVIDUALS, EMPLOYERS AS ORGANISATIONS: THE CONTINUED INFLUENCE OF EMPLOYER BEHAVIOURS ON POLICY SUCCESS**

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### **Abstract**

In 2014 major reforms were announced to the apprenticeship system in England as a result of a consultation into the impact and perceptions of apprenticeships under the existing framework model. With the positioning of employers as the leaders of the development of Apprenticeship Standards and their related Assessment Strategy, this paper considers the distinction between the employer-as-individual, the employer-as-role, and employer-as-organisation, and their respective relationships with the intermediary organisations, government departments and other members of the network. This is particularly meaningful in England, where the education background of the individual may be seen to have a more pronounced influence on attitudes towards VET than in other countries. The paper recognises that the impact of this must be balanced to ensure that theories are not developed purely on the basis of characteristics of individual actors rather than the properties of the network itself.

The partial failure of policy reform in VET in England may be attributed to factors such as competing drivers and outcomes and a lack of policy stability over time, also social attitudes towards it. Contributions to system, policy and curriculum reform are made by individuals, not organisations, and history and culture in England continues to drive aspects of reform and implementation in ways that remain largely unacknowledged. A policy narrative which suggests a vocabulary change away from 'vocational' and 'apprenticeship' to increase take up of qualifications and programmes currently under these banners, should continue to be examined.

Previous work has shown that the personal attitudes towards, and experiences of, vocational qualifications and programmes often influence their implementation in an organisation, in sometimes surprising ways. Interviews with employers in the early stages of implementing the new Apprenticeships will explore their responses to the process of creating standards and assessment strategies, implementing these [and comparison with the implementation of previous frameworks], the impact of the levy, the impact on the number of apprentices being recruited in which sector.

The research is intended to support the meaningful engagement of employers throughout policy creation and implementation by openly acknowledging some of the cultural challenges involved in embedding Apprenticeships in organisations, some of which have previously had little involvement with such programmes. It will provide a different perspective on meeting government targets, for example, which are not always transparent to those trying to work with employers.

**Keywords:** *Employers, apprenticeships, policy, vocational.*

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## ENGAGING STUDENTS FOR THE LEARNING AND ASSESSMENT OF THE ADVANCED COMPUTER GRAPHICS MODULE USING THE LATEST TECHNOLOGIES

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### Abstract

The advanced computer graphics has been one of the most basic and landmark modules in the field of computer science. It usually covers such topics as core mathematics, lighting and shading, texture mapping, colour and depth, and advanced modeling. All such topics involve mathematics for object modeling and transformation, and programming for object visualization and interaction. While some students are not as good in either mathematics or programming, it is usually a challenge to teach computer graphics to these students effectively. This is because it is difficult for students to link mathematics and programming with what they used to see in video games and the TV advertisements for example and thus they can easily be put off. In this paper, we investigate how the latest technologies can help alleviate the teaching and learning tasks. Instead of selecting the low level programming languages for demonstration and assignment such as Java, Java 3D, C++, or OpenGL, we selected Three.js, which is one of the latest and freely accessible 3D graphics libraries. It has a unique advantage that it provides a seamless interface between the main stream web browsers and 2D/3D graphics. The developed code can be run on a web browser such as Firefox, Chrome, or Safari for testing, debugging and visualization without code changing. The unique design patterns and objectives of Three.js can be very attractive to third party software houses to develop auxiliary functions, methods and tutorials and to make them freely available for the public. Such a unique property of Three.js and its widely available supporting resources are especially helpful to engage students, inspire their learning and facilitate teaching.

To evaluate the effectiveness for using Three.js in teaching computer graphics we have set up an assignment for scene modeling in the last 4 years with focuses on the quality of the simulated scene (50%) and the quality of the assignment report (50%). We have evaluated different assessment forms of the module that we taught in the last four years: in 2013-2014 the module consisted of 20% assignment and 80% exam based on Java 3D; in 2014-2015 the same proportion of assignment/exam but based on WebGL, in 2015-2016 the module was 50-50% of assignment and exam but based on Three.js; and in this year the module is 100% assignment based on Three.js. The effectiveness of the module delivery has been evaluated both qualitatively and quantitatively from five aspects: a) average marks of students, b) moderator report, c) module evaluation questionnaire, d) external examiner's comments and e) examination board recommendations. The results have shown that Three.js is indeed more successful in engaging students for learning and the 100% assignment assessment enables students to focus more on the design and development. This four year result is really encouraging to us as an educational institute to embrace the latest technologies for the delivery of such challenging modules as computer graphics and machine learning.

**Keywords:** *Computer graphics module, Assessment, Assignment, Latest technologies, Student engagement.*

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### 1. Introduction

Higher education has been considered as one of the most influential factors to the future of youngsters. Regardless of the particular motives for individuals to take part in the university education, one of the most common goals is to learn something from the university that may be useful for their later life. However, to meet this basic requirement/goal is actually very challenging! This is because various

factors, such as the students' personal backgrounds and commitments, together with the changing and abstract nature of the intended study, delivery, support and assessment by the course would give variable results. From the university perspective it is important to ensure all means to help design and deliver the module and facilitate the learning process as much as possible.

Technology has been a widely used tool to enhance the teaching and learning of science in various disciplines. For example, videos have been used in (Alkhalaleh, Hasan, Al-Rawajfah, 2017) for instructing the skills of the Cardio-Pulmonary resuscitation to medical students. It is found that the method is as effective as traditional class form lecture format of teaching. A mobile system has been developed (Mohamed, Chebbi, Behera, 2016) to help students to learn at any time and locations at their own paces. The study reported by (Chowdhry, Sieler, Alwis, 2014) has shown that it is necessary to continuously improve the method for technology-enhanced teaching and also the learning skills of staff in order to enhance the student learning efficiency.

In this paper, we investigate the main issues in the delivery and assessment of the advanced computer graphics module enhanced by the latest open source library Three.js. While such module finds numerous applications in the real world such as computer games, data analysis and visualization, and specialized effects in the films and TV advertisements, the topics are usually abstract for students to link the course to the real world. With the technological development in programming and the availability of high computational power, various new programming languages such as Java3D and WebGL and open source libraries such as Three.js have been developed. Interestingly enough, various routines in the creation of a computer graphics system can be encapsulated without being changed from one application to another, so that the end user can just focus on the core tasks such as object modeling.

Three.js is an open source 3D graphics library, whose code can be run seamlessly on the mainstream web browsers such as Chrome, Mozilla Firefox, and Safari. It provides an intuitive application programming interface (API) between the 3D graphics, web browsers, and hardware. In this case, we use it for topics explanations, demonstrations, practicals, and assignment. With each main topic covered in the class such as core mathematics (e.g. trigonometry, matrix and vector algebra), lighting and shading, texture mapping, buffers, colour and depth, advanced modeling and ray tracing, (i) various demonstration programs have been developed in Three.js to show the effects generated, (ii) a practical of up to two hours is designed after each topic so that students can see the basic implementation of a relative system and then modify, implement and complete the required tasks, (iii) an assignment is setup based on the topics covered and the practical experimentations. One session has also been designed for answering questions two weeks before the deadline for the assignment submission.

To evaluate the effectiveness of the Three.js for learning and teaching, a comparative study is carried out in the last four years based on Java3D and WebGL assessed with different weights between assignments and examinations. The evaluation is carried out from different aspects: the average marks of the class, feedback from the middle term module evaluation questionnaire (MEQ), and comments from the external examiner, the module moderator, and the examination board.

## 2. Content design and delivery

In this section the design and delivery of the contents in the module is outlined. While the course normally covers topics such as lighting, shading and texture mapping; it is crucial to create a virtual world for the visualization, demonstration and interaction of the objects of interest.

### 2.1. A general framework of a computer graphics system

A general framework for the creation of a computer graphics system can be built below using Three.js (Yadav, 2015; Liu, Liu, Zhao, Song, 2016) as:

```
<html>
  <head>
    <title>My first Three.js app</title>
    <style>
      body { margin: 0; }
      canvas { width: 100%; height: 100% }
    </style>
  </head>
  <script src="js/three.min.js"></script>
  <body>
    <script>
      // Our Javascript will go here.
    </script>
  </body>
</html>
```

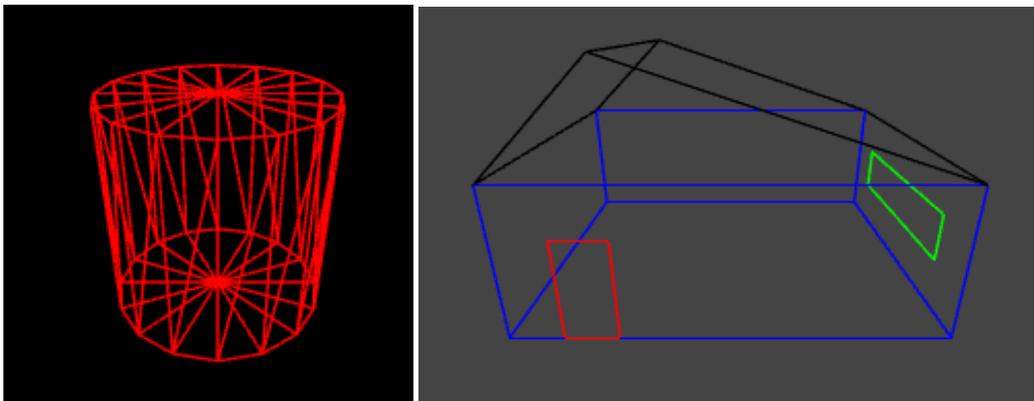
This framework can be stored as a file called `my3d.html` in the current directory, `c:\graphics`, which can then be run on the commonly used web browsers such as Chrome and Mozilla Firefox: `file:///c:/graphics/my3d.html`. It is a modified version of the standard html document file (HTML, 2016), starting with a tag of `<html>` and ending with a tag of `</html>`. It includes two parts, head and body. The head element is a container of metadata and typically defines the document title, styles, links, scripts, and other metadata. It has a start tag of `<head>` and an end tag of `</head>`. The body element defines the document body, and has a start tag of `<body>` and an end tag of `</body>`. The line `<<script src="js/three.min.js"></script>>` tells the browser that the minimized version of Three.js has been stored in the subdirectory `js` and will be called in and used for interpreting the subsequent code. Then the 3D contents will be created and inserted into the body of the document for visualization and interaction.

## 2.2. Example content generation

To actually display an object in the above framework, we need to define three basic objects: camera, renderer, and scene. The scene describes the objects and their living world. The camera defines how the scene will be visualized. The renderer projects the scene onto the image plane of the camera. All such objects include varying numbers of variables for their specification and manipulation.

For example, we define two variables for the size of the canvas onto which the scene will be drawn as: `var width=window.innerWidth/2; var height=window.innerHeight/2` as half of the width and height of the current viewing window. The renderer is defined as a variable: `var renderer = new THREE.WebGLRenderer({antialias: true});` as a new instance of the class `THREE.WebGLRenderer` with the variable `antialias` taking the value of "true" so that the boundaries of the rendered objects will be smoothed. The size of the renderer is set as: `renderer.setSize( width, height );` using the variables `width` and `height` just defined above. The rendered objects need to be inserted into the body of the html file for visualization as `document.body.appendChild( renderer.domElement );` The scene is defined as an instance of the class `THREE.Scene`: `var scene = new THREE.Scene();` The camera is defined as a variable: `var camera = new THREE.PerspectiveCamera( 75, width / height, 0.1, 1000 );` as an instance of the class `THREE.PerspectiveCamera` taking four parameters: `75` is the angle for the vertical field of view, `width/height` defines the aspect ratio of the camera frustum, `0.1` and `1000` define the closest and farthest planes between which the objects will be rendered and displayed. All other objects, either too close or too far away from the camera, will not be rendered and displayed. Then the camera is moved away from the origin of `(0, 0, 0)` along the `z` axis by `20` units as: `camera.position.set(0, 0, 20);` Finally, the defined camera is inserted into the scene as: `scene.add(camera);` So far the virtual world has been created and a computer graphics system has been set up.

Figure 1. The visualization of the cylinder(left) and house(right) designed.



Suppose that a cylinder will be created and displayed in the virtual environment defined above. An object has to be defined from two aspects as an instance of the class `THREE.Mesh` in `Three.js`: geometry and material. The geometry defines the geometrical description of the object of interest, while the material defines how the object will look like. A primitive `THREE.CylinderGeometry` has been defined in `Three.js`. In this case, we can directly call it our application as: `var geometry = new THREE.CylinderGeometry(5, 5, 10, 16);` taking four parameters: specifying the radius of the top and bottom, height and the number of segments in the top and bottom of the cylinder. The material is defined as a variable: `var material = new THREE.MeshBasicMaterial( { color: 0xff0000, wireframe: true } );` as a new instance of the class `THREE.MeshBasicMaterial` with a color of red represented as `0xff0000` in the hexadecimal format and rendered as wireframe. Then the cylinder is defined as `var cylinder = new THREE.Mesh(geometry, material);` In order to see the top of the cylinder, we rotate it along the `x` axis by `30` degrees as: `cylinder.rotation.x = Math.PI * 30 / 180;` where the rotation angle has to be represented in radians. The cylinder is added into the scene for display: `scene.add(cylinder);` Finally, the method

`renderer.render(scene, camera)` is called to project the cylinder onto the canvas by the renderer for visualization as illustrated in Figure 1.

From the above discussion, it can be seen that it is relatively easy to define with intuitive commands the environment, camera, and rendering process, and add objects into the scene for visualization. All such operations have been encapsulated so that the particular applications do not require much time on such routine works but focus on the core tasks such as cylinder modeling instead.

### 2.3. Advanced content generation

In this section, we demonstrate how Three.js can be applied to implement a complicated object, a house in wireframe, in this case, in which various classes, methods, transformations, configurations, and representation will be involved in an easy to understand and follow manner. First, we have to define a variable: `var house= new THREE.Object3D()`; as an instance of the class of `THREE.Object3D` to hold its components: front wall, right wall, left wall, rear wall, right roof, left roof, front window and right window and add it into the scene as `scene.add(house)`; Each of these components is represented as a rectangle. The corners of these rectangles have to be designed carefully, considering their desired sizes and locations as: `var vertices = [ new THREE.Vector3(-4, -3, 0), new THREE.Vector3(4, -3, 0), new THREE.Vector3(4, -3, 3), new THREE.Vector3(-2, -3, 5), new THREE.Vector3(-4, -3, 3), new THREE.Vector3(-4, 3, 3), new THREE.Vector3(-2, 3, 5), new THREE.Vector3(4, 3, 3), new THREE.Vector3(4, 3, 0), new THREE.Vector3(-4, 3, 0), new THREE.Vector3(-3, -3, 0), new THREE.Vector3(-2, -3, 0), new THREE.Vector3(-2, -3, 2), new THREE.Vector3(-3, -3, 2), new THREE.Vector3(4, -2, 1), new THREE.Vector3(4, 2, 1), new THREE.Vector3(4, 2, 2), new THREE.Vector3(4, -2, 2)]`; Then these vertices have to be associated with a particular component.

Firstly, we define geometry and material variables for the representation of all these components as new instances of the classes `THREE.Geometry` and `THREE.LineBasicMaterial` respectively. For the front wall, they are defined as: `var lineGeom1=new THREE.Geometry()`; `var lineMat1=new THREE.LineBasicMaterial( {color: 0x0000ff })`, leading the front wall to be defined as: `var face1=new THREE.Line(lineGeom1, lineMat1)` as a wireframe in blue; then we add it into the house as: `house.add(face1)`; To instantiate `lineGeom1`, we have to provide the vertex information as: `lineGeom1.vertices.push(vertices[0]);` `lineGeom1.vertices.push(vertices[1]);` `lineGeom1.vertices.push(vertices[2]);` `lineGeom1.vertices.push(vertices[4]);` which essentially define a closed rectangle with the first, second, third, and fifth vertex already defined above; All the walls, roofs and windows can be defined similarly but with different sets of vertices (1, 8, 7, 2), (0, 4, 5, 9), (5, 7, 8, 9), (2, 7, 6, 3), (3, 6, 5, 4), (10, 11, 12, 13), and (14, 15, 16, 17). Note that some vertices are shared by different walls and roofs. Thus, they must be specified correctly. Suppose that the roof is represented in black, the front window is in red, and the right window is in green, then their materials are defined as: `var lineMat5=new THREE.LineBasicMaterial( {color: 0x000000})`; `var lineMat7=new THREE.LineBasicMaterial( {color: 0xff0000})`; and `var lineMat8=new THREE.LineBasicMaterial( {color: 0x00ff00})`; respectively.

In order to see the top of the house, it is first moved away from the original (0, 0, 0) by -2 units along the y axis as: `house.position.y = -2`; then it is rotated by -70 degrees along the x axis as: `house.rotation.x = -Math.PI*70/180`; The built house is illustrated in Figure 1. From the above discussion, it can be seen that: (i) all the details of the object of interest must be designed clearly and described explicitly, (ii) the designed models can be translated into the language of Three.js relatively straightforward for visualization.

### 3. Assessment and evaluation

In this year the module was assessed purely based on the assignment: scene modeling and navigation. The students submitted both the source code and a report describing the contents of the scene and explaining how the objectives were achieved. Each element is worth 50% assessment of the module. The quality of the scene was marked from three aspects: complexity (20%), functionality (20%) and creativity (10%), while the report was marked from three aspects as well: description (15%), discussion (30%), and presentation (5%) of the report.

The performances of the classes in different years are presented in Table 1: clearly, the number of students registered onto the module increases over the last four years. Even so, the average performance of the class has not been dragged down. On the contrary, it has been increased steadily due to various factors, one of which is the adoption of the latest technologies of Three.js for the effective design and delivery of the model contents. Also, it is noted that the outstanding performance of the class this year in comparison to previous three years, is because the module was assessed purely based on assignment. Thus, we can conclude that the pure assignment based assessment enabled students to focus on the design, implementation, and test of the system without being distracted by the exam.

Table 1. The performance of the class in different academic years.

| Academic year | #(students) | Assign/exam(%) | Average (%) | Std. dev. (%) | Failure rate (%) |
|---------------|-------------|----------------|-------------|---------------|------------------|
| 2016-2017     | 57          | 100/0          | 64.56       | 12.48         | 1.78             |
| 2015-2016     | 39          | 50/50          | 59.10       | 17.77         | 10.26            |
| 2014-2015     | 34          | 20/80          | 59.68       | 15.84         | 8.80             |
| 2013-2014     | 14          | 20/80          | 58.00       | 17.18         | 7.10             |

Feedbacks with positive comments like: “The module was well run and students seemed to engage well with the assignment. It might be worth briefly mentioning coding style, and especially use of global variables in the JavaScript that is available for use by the students.” from the moderator, “Really good well taught module!”, “Feedback has been well acted on”, and “Some of the lectures have a heavy mathematical focus which although useful, can end up being a bit overwhelming sometimes.” from the middle term MEQ this year. Some comments from the middle term MEQ in 2015-2016 are: “The module is very good structurally, could use a bit harder material such as OpenGL.” The comments from the external examiner are: “a large amount of computation involved in the answers. The questions are in the right level.” in 2015-2016 and “General: a large amount of contents involved in the 2 hour examination, but only three questions answered from five. The question level is fine.” in 2014-2015. All the results have been accepted as a set by the departmental examination board.

#### 4. Conclusions

This paper investigates two main issues: the delivery and assessment of an advanced computer graphics module. To facilitate the delivery of the contents in the module, we adopted the latest open source library Three.js as the main language for topics explanation, demonstration, practical experimentation and assignment. The package has an advantage that normal routine functions are encapsulated, various primitives are provided, the code can be easily tested on the main stream web browsers and students can thus just focus on the core tasks such as object modeling. The module was assessed purely on an assignment with a submission of two elements: source code and a report so that students can just focus on the design, implementation, test and report writing without being distracted by the exam. Various means have been employed to evaluate the effectiveness of such “technology enhanced learning and assignment only” course. A comparative study of the learning and teaching in the last four years has shown that this approach does enhance the efficiency of learning and teaching of the module and leads to a positive change in the attitude of students to learn (Kirkwood and Price, 2014). This is demonstrated by the fact that the students picked up the topics more quickly, were more capable to develop a system for testing, and dedicated themselves to improve the creativity of the system more eagerly. We are thus encouraged to embrace the latest technologies for the teaching and delivery of such challenging modules as computer graphics and machine learning.

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## **THE IMPACT OF TRAILBLAZER STANDARDS ON THE DELIVERY OF APPRENTICESHIPS**

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### **Abstract**

In 2014 major reforms were announced to the apprenticeship system in England and are due to be fully implemented by 2020. The reforms were the result of a consultation into the impact and perceptions of apprenticeships under the existing framework model. Sector-based employer groups are coming together to lead on the creation of Trailblazer Apprenticeship standards and assessment strategies.

The move from qualifications and frameworks to standards will have a significant impact on the structure and delivery of apprenticeships. This paper looks at the early experiences of two large employer organisations as they work with an assessment organisation to set out the structure of the apprenticeship programme and review what this means in terms of training delivery and outcomes. It looks at the interpretation and practical implementation of end point assessment (EPA), at the creation and inclusion of credentials as part of the new standards, and the impact of these on the learner.

A number of face-to-face interviews will be carried out with the employer, the related training provider(s), in-house trainers and apprentices, some of the latter pursuing existing framework apprenticeships, others starting on the new ‘trailblazer’ standards. Interviews will also be carried out among assessment organisation staff. Organisations and training providers will be asked to reflect on the process of creating standards and EPAs, and of engaging with an assessment organisation in relation to these. They will also be asked to consider the impact of the new standards on apprentices and their organisations from recruitment, through delivery, to learner outcomes.

The findings of the research will be used to identify good practice and lessons learned from the perspectives of the employer, a training provider and an assessment organisation, to inform the implementation and delivery of apprenticeships. The research will also reflect on the experience of the apprentice and the value of the new standards and outcomes from their perspective. Finally, the outcomes will be used to inform the critical ‘employer engagement’ aspect of assessment organisation work in relation to the new standards and assessment strategies.

**Keywords:** *Policy, apprenticeships, implementation, change, delivery, employers.*

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### **1. Introduction**

The introduction of standards-based Apprenticeships in the UK in response to government policy (<https://www.gov.uk/government/collections/apprenticeship-standards>) has triggered some early indicators of the impact of the new programmes on businesses, learners and business practice. The positioning of employers at the heart of policy delivery – creating standards, deciding on assessment strategy, for example – presents both opportunities and challenges for awarding organisations, employers and training providers.

Previously, frameworks, and some of their component parts such as the standards on which National Vocational Qualifications (NVQs) were based, were defined by sector bodies such as Sector Skills Councils and Industry Training Organisations. These were responsible for representing the employer voice, and worked with wider stakeholders. Some of these were considered to be more successful – and more representative – than others, and prevented some of the fragmentation currently emerging in sectors such as Construction. Even successful Trailblazer groups necessarily only include a handful of the potential employers in a sector.

With the employer responsible in policy for defining the content of the apprenticeship, and in some cases, the assessment strategy, and these being approved by government bodies prior to the involvement of key partners such as awarding organisations, whose expertise in assessment, for example, is long-established, there is a significant risk in some sectors that what has been approved cannot be

delivered. The introduction of a levy – a sum of money equivalent to 0.5% of the pay bill of any employer whose pay bill is £3m or more, and which attracts a £15,000 allowance to those contributing to offset their payment – means that there is more money available to the treasury to upskill the workforce. As this paper will touch on, however, it is also a measure which is driving unexpected and occasionally unhelpful behaviours among those paying it.

Pearson is an awarding organisation, which means that it provides qualifications, assessment and learning services in a wide range of regulated and non-regulated subjects and sectors. For the Trailblazer Apprenticeships, however, in common with other awarding organisations, its role has switched to one of assessment organisation. This paper discusses the early stages of a proposed three-year research programme to establish the impact of the move from framework to standards-based Apprenticeships on employers, training providers and apprentices. As the first Apprentices associated with Pearson reach the End Point Assessment Gateway, this research reflects on the early stages of the organisation's involvement with Trailblazers and asks:

1. What is the impact on employers and other stakeholders, of the move from framework- to standards-based Apprenticeships?
2. What lessons can be learned from the creation and implementation of the early Trailblazer standards and assessment models?

## 2. Background

The relationship with vocational education and training has always been problematic among employers and society in England. Learners tend to be steered towards the academic track through a combination of policy and funding trends, by schools and parents, and through an entrenched belief in the superiority of the academic track among these same stakeholders. Employers filter potential employees by qualifications on their curriculum vitae, and since A' levels were first introduced in the 1950s, most people are familiar with them and understand what a learner has achieved. This is not always the case with newer programmes of study. These behaviours have contributed to the shortage of skilled workers faced by the UK. The efforts of successive governments to address the skills shortage have been only partially successful, with many failing to address long-established issues with vocational education in the UK. The skills shortage has been partly masked by the free movement of people within the EU, and the consequent ability of employers easily to hire skilled staff from outside the UK. The recent referendum resulting in 'Brexit', however, has brought further into focus the need to upskill the homegrown workforce. Improving apprenticeship provision is seen as an important way to achieve this.

This latest round of reform is a result of the Richard Review of Apprenticeships (2012), which envisaged apprenticeships as a partnership between the learner, the employer and society – all of whom should benefit. In 2014 major reforms were announced to the apprenticeship system in England, which are due to be fully implemented by 2020 (BIS, 2014).

From the composition of employer groups – and the frequent exclusion of other key partners and experts at this stage – to the funding levy and the introduction of EPA to demonstrate the achievement of the competencies set out in the standards, Trailblazer Apprenticeships have a very different feel to them from those based on frameworks.

Ofsted (2015), a national body in England, which regulates learning and skills provision for learners of all ages, found that whilst the number of apprenticeship starts, and funding spend on apprenticeships, has increased in recent years, not all apprenticeships of a similar level on the national qualifications framework (NQF) level were of similar demand. Also, that the skills acquired have been mainly at a low level in retail, customer service, care and hospitality. Other criticisms included the variation in the time needed to complete in some sectors, meaning an apprenticeship of a similar level in two different sectors might take as little as six months or as long as three years. In extreme cases, Apprenticeships were being awarded following a mere three months of work and minimal training. This not only affected the supply of skills in the economy, it damaged the reputation and credibility of Apprenticeships as a whole.

The Post-16 Skills Plan (2016) placed employers at the heart of standards development and of setting the assessment strategy for the new Apprenticeships. The intention is that a group of employers comes together and defines a set of skills and competences on no more than two sides of paper. It is then clear to employers and other stakeholders exactly what must be achieved by the apprentice. The argument in favour of this design is that unlike frameworks, where the individual components might be achieved through qualifications unfamiliar to many stakeholders, and of varying quality, the standards set out for all what an apprentice should achieve.

A number of potential issues arise from this. Employers are not a single body – they vary by size, location, business focus, for example. Only a handful of potential employers in a sector will have the

capacity or desire to support the creation of occupational standards. Whilst employers may know what skills are required for roles within their organisation, the limited number attending Trailblazer groups to define standards means that a representative set of knowledge and skills for all the occupations in that area of a sector, fit for use in any region, size of business etcetera is very difficult to achieve. This in turn leads to issues of transferability for those achieving the apprenticeship.

The role of the awarding organisation, which would previously have led the development of qualifications, has changed to one of assessment organisation, with a Register of Apprentice Assessment Organisations (ROAAO) held by the government body the Institute of Apprenticeships, and a monthly bidding process to admit interested and qualified parties onto the list. Some sectors, such as Engineering, have kept existing qualifications as part of the framework. Others, such as the Smart Meter apprenticeships are reliant solely on End Point Assessment (EPA), that is, assessment by an independent, occupational specialist.

This may require relatively complex arrangements with assessment organisations, but more practically, requires the sector concerned to ensure that there are sufficient, independent, assessors, both occupationally qualified and trained to make assessment judgements, available when needed. This can be problematic in an employer the size of the National Health Service where the sheer volume of apprentices – and the number of assessors required to service the assessment strategy – may lead to a mismatch between need and availability, and ultimately prevent well-intentioned assessment strategies for individuals being unachievable. The levy will mean that some employers are incentivised to repackage existing training and call it an apprenticeship. This may force employers to offer an assessment regime such as a two-hour professional discussion, which may be completely unmanageable in some work contexts, and therefore a bad experience for the learner.

The radical changes that occur between, and sometimes within, a period of government, are largely politically rather than pedagogically driven (Whitty, 2002). This can result in policy changes being applied across the board – in this case to all sectors - rather than the focus being on improving those to which previous policy may not have been best-suited. It has also resulted in qualifications being given a dual role, with often competing aims – a desire to position academic and vocational qualifications as ‘equivalent’ rather than having their own merit (Hodgson and Spours, 2003; DfE, 2016).

### 3. Methodology

As a major provider of Apprenticeships, Pearson is seeking to examine the impact of the introduction of Trailblazer Apprenticeships on its own business, its customers – both employers and training providers – and critically, the apprentice themselves. A three-year programme of evaluation encompassing the Pearson technical routes – based largely on the sectors found in the Sainsbury Review<sup>1</sup> (2016) – has been set up to gather evidence against BTEC Nationals, frameworks and Trailblazer Apprenticeships, and Higher Nationals. Drivers for more in-depth studies – Case Studies comprising of interviews, focus groups and observations with key stakeholders - such as the one discussed here, include existing statistical data from national studies such as Free School Meals data, statistical data generated by surveys conducted as part of this research programme, government policy and Pearson’s business strategic priorities.

Policy in England changes rapidly, sometimes within the lifetime of an administration, rather than as a result of a new one. Early reflections on the process of development of the Trailblazer standards, their assessment strategy and implementation may enable improvements to access and achievement during the lifetime of the Apprenticeship programme. Longitudinal studies can mean that findings are at best historic, at worst no longer relevant. Where the intention is to consider the experience of learners, for example, a case study may enable issues and benefits to be identified early in a programme, and for lessons to be learned during the delivery period, rather than being a reflective process when a programme of delivery has ended.

Case studies are ‘designed to bring out the details from the viewpoint of the participants by using multiple sources of data’ (Djurić, 2010: p.175) and to ‘maximise what can be learned in the period of time available for the study’ (p.176). They are intended to provide ‘multiple lenses, mixing history and analysis, specific detail and wider implications’ with a view to maximising what can be learned in the time available and contributing to the ‘wider debate as well as offering a rounded account of a particular subject’ (p.176).

The Case Study method is not without its flaws. It provides an excellent opportunity to look at a situation in depth, and to potentially identify a theme or finding, which in turn may be used to inform or understand wider trends in the implementation of Trailblazer Apprenticeships. Its impact is limited at present, however, by the small number of Trailblazers in operation – and the relatively small number of

<sup>1</sup><http://www.gatsby.org.uk/uploads/education/reports/pdf/report-of-the-independent-panel-on-technical-education.pdf>

apprentices pursuing them – limiting the ability of the research to make anything but cautious claims of cause and effect. It may be that as the programme of research matures, observations of delivery and assessment would provide additional rich data to enable greater insight into the practical implications of standards-based Apprenticeships.

The early findings in this paper come from the experiences of two large employers as they work with an assessment organisation to set out the structure of the apprenticeship programme and review what this means in terms of training delivery and outcomes. It looks at the interpretation and practical implementation of EPA at the creation and inclusion of credentials as part of the new standards, and the impact of these on the learner.

This early research consists of face-to-face interviews with the employer, the related training provider(s), in-house trainers and apprentices, some of the latter pursuing existing framework apprenticeships, others starting on a standards-based Apprenticeship. Interviews will also be carried out among assessment organisation staff. Organisations and training providers will be asked to reflect on the process of creating standards and EPAs; of engaging with an assessment organisation in relation to these, and the impact of the new standards on apprentices and their organisations from recruitment, through delivery, to learner outcomes.

#### **4. Findings to date**

Whilst there are political reasons behind the apparent policy churn (Marschall and Shah, 2005), in this area, this paper concentrates on the practical implications of the introduction of standards-based apprenticeships.

Early findings indicate both positive experiences and a number of potential issues arising from the move from frameworks to standards-based Apprenticeships, each of which will require careful monitoring as the programmes start to be delivered. The move from qualifications and frameworks to standards looks set to have a significant impact on the structure and delivery of apprenticeships.

##### **4.1. Tensions and the levy**

The new standards risk excluding many small employers and their employees from the process. Also, whilst the accreditation of low level skills damaged the reputation of some framework apprenticeships, the pressure on employers to use their contribution to the funding levy may drive behaviours such as the use or rejection of standards based on the amount of funding available for a given occupational route.

Government policy appears contradictory in its desire to drive up both numbers and quality. Employers are keen to recoup the money they have contributed to the levy, but they will do this in the best interests of their business – a move which may not be in the best interests of the individual learner or the wider economy. Some employers have suggested that they will focus mainly on upskilling their existing workforce, to ensure that the funding they reclaim from the levy payment effectively remains within their business.

Funding is capped at different levels depending on the occupational route. Whilst the intention behind this policy may have been to increase the number of apprenticeships in a given sector or occupation, an unintended side-effect may be that fewer employers will train apprentices where the funding cap is low, as it would require more apprentices, and administrative effort, to use the levy each financial year.

Now that the government has secured a funding contribution from employers in the form of the levy – a proportion of their turnover to be set aside for training – employers are of course keen to recoup their money. Where employers may feel that Apprenticeships, certainly in the number being demanded by government, are imposed rather than a free choice, this has given rise to questions such as ‘Who will pay for a second assessment if the apprentice fails the first?’

##### **4.2. Transferability and progression**

Where frameworks have become standards that do not include a nationally recognised qualification – rather EPA, which may have been designed by a large organisation, and may not be translatable into smaller businesses – there may be an impact on transferability and progression for the learner.

The absence of a nationally recognised qualification in many standards may result in variations of quality and acceptance as employers overlook some qualified individuals in favour of those trained by nationally or regionally known employers, or holding other qualifications more familiar to the employer. Whilst the change in some sectors, which have kept existing qualifications and proxies as part of their standards, may be minimal, for some sectors, employers have set out their ideal approach, unfiltered by practical considerations. The reasons why some sectors have kept existing qualifications are being probed further. The author is not uncritical of the governance structures and roles of partners such as awarding

organisations in previous incarnations of policy, and this will be discussed in more depth as part of the programme of research.

This means that in some sectors, the proposed assessment plan will be hampered by a lack of qualified assessors. In one sector in particular, the requirement is 75,000 newly-trained assessors, and the individuals, trained or not, simply do not exist. Such an issue might have been picked up with a different configuration of stakeholders involved in the early process. The desire to ensure that key elements were industry-led, however, has led to a process which in some cases has excluded experience and created preventable and potentially insurmountable obstacles. In the Logistics sector, the composition of the framework, with no proxy qualifications included, means that theoretically, a driver holding a full British driving licence might be assessed as a non-competent driver in a final assessment.

#### 4.3. The changing roles of stakeholders

With the employer responsible in policy for defining the content of apprenticeships, and in some cases, the assessment strategy, and these being approved by government bodies prior to the involvement of key partners such as awarding organisations, whose expertise in assessment, for example, is long-established, there is a significant risk in some sectors that what has been approved cannot be delivered.

The limited configuration of employer groups and their lack of longevity limits their availability to iron out initial teething problems with implementation (employers have businesses to run). Where assessment organisations and employers have worked successfully together, the process has been time-consuming but has allowed genuine reflection and action - on how things could be done differently to ensure that apprenticeships are completed in a timely manner, and that achievements are independently verified. Whilst standards may exist for an occupation, and have been defined by employers, if no assessment organisation is approved - or willing to be so - to carry out the EPA, the Apprenticeship cannot be delivered.

### 5. Next Steps

The research programme is in its very early stages but even the initial findings can be used to inform actions and behaviours from the very start of the process: engaging with employers, ensuring that training and assessment strategies are appropriate and deliverable; ensuring the best learner experience; creating products and services to enable employers to make the most of the funds they have invested via the levy, and ensuring that the expertise of all necessary stakeholders is included during the development and delivery process. The findings will also inform further case studies throughout the programme.

Interim research findings will be translated into actions to learn from and improve the stakeholder and learner experience as far as possible, based on the data generated. Overall programme findings will be used to inform the design of Pearson technical routes.

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# HOW CAN THE TECHNOLOGY INTRODUCTION FOSTER EDUCATIONAL INNOVATION IN VET CENTERS? A COMPARATIVE CASE STUDY

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## Abstract

Since the mass diffusion of Information and Communication Technology (ICT), Italian educational institutions have been implementing several experimental projects in order to enhance students learning experience (Moricca, 2016). The initial Vocational Education and Training (VET) has been part of this innovation process with several pilot projects, such as *iCnos*, which aims at introducing ICTs as support to teachers' activities and students' learning process (Franchini, 2015). This project has been led by the central management of CNOS-FAP federation through several teacher training courses, the empowerment of internet connections and the substitution of paper handbooks and notebooks with the iPad. Each center involved in the pilot project has managed independently the innovation process based on the guidelines issued by the central management. The main research questions of this exploratory study are as follows: Can an institutional innovation process - managed with a top-down approach - fosters pedagogical and organizational changes in VET centers? Which aspects and roles are involved in this innovation process? How do teachers and students perceive and react to this innovation process? Which are the solutions implemented by the different centers? Which are the shortcomings? Which solutions have been implemented by the centers? To answer these research questions a comparative case study has been conducted (Campbell, 2010; Yin, 2009). Four VET centers were selected. The teachers in charge of the coordination of the project of each center were interviewed with a semi-structured questionnaire; project documentation and teaching materials were also gathered. The analysis has followed an iterative, grounded approach and included the use of Nvivo 11 (qualitative data analysis software) (Charmaz, 2006; Glaser, Strauss, & Strutzel, 1968). The comparison of interviews and the other gathered data shown that the innovation process has been taking different forms in every VET center context. The analysis also suggests that there are several core factors in the innovation process investigated. The main results could represent a set of good practices that could be taken into account by the CNOS-FAP federation when the *iCnos* project will be extended to all the federation centers. In this sense, this study may be also useful in similar contexts.

**Keywords:** Educational technology, innovation process, tablet, VET project, comparative case study.

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## 1. Introduction

Since the beginning of the eighties, the technology innovation has been representing a big challenge for the Italian education system. The Italian Ministry of Education, with the support of European Social Found, has been attempting to foster innovation processes supported by technology into the education system through the promotion of teacher training programs (eg *ForTic*<sup>1</sup> and *PNSD*<sup>2</sup>) and experimental projects (eg. *Cl@ssi 2.0* and *Scuol@ 2.0*) (Biondi, 2007; Moricca, 2016). Also the initial Vocational Education and Training (VET) has been part of this innovation process with several initiatives: one of these is the experimental project *iCnos* which aims at integrating Information and Communication Technologies (ICT) into daily students activities (Franchini, 2012). Over the years, different good experiences have been made with the recognition of several good practices. But nevertheless, also several problems have been identified. These critical points may hinder an innovation process that should involve the entire Italian education system (e.g. lack of adequate instructional design, inadequate internet connection in the schools, obsolescence of devices supplied, resistance of teachers to change instructional practices, overestimation of ICT efficacy etc.) (Pellerey, 2015; Ranieri, 2011). In addition, many of these projects are restricted in single classes or schools. Therefore, the researchers think it could be useful studying change processes involved in the project *iCnos*, that involves an entire federation of VET centers. The main purpose of this study is to highlight good management strategies and

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<sup>1</sup>ForTic: National training plan for teachers on ICT

<sup>2</sup>PNSD: Digital School National Plan

critical elements without ignoring pedagogical aspects. This work represents the exploratory part of a wider research project that aims to discover if and how an institutional innovation process can be fostered through the introduction of ICT in daily practices of teachers and students in VET centers.

## 2. Research context: the *iCnos* project and the CNOS-FAP federation

The CNOS-FAP federation is an organization promoted by “National Centre for Salesian Works” and it has been operating since 1982. The federation counts 60 VET centers in 16 Italian regions. These centers provide 3 years initial Vocational Education Training courses. The professional sectors promoted through his centers are: mechanical, electronic, graphic, tertiary, and tourist. It coordinates the promotion and the vocational training activities of its centers through regional delegations (CNOSFAP, 2017). The *iCnos* project, started in 2012, has been promoted and led by the central coordination of the federation through the organization of pedagogical and technological teacher training courses, the empowerment of internet connections of the centers and the development and diffusion of guidelines. Furthermore, students families were asked to buy an iPad device instead of textbooks. A teacher was in charge of coordinating independently the innovation process in each center (Franchini, 2012). At the beginning of the experimental project, 7 centers, 744 students, and 210 teachers were involved. In 4 years, other centers were included in the project: currently (school year 2016/2017) 26 centers, 3100 students and 350 teachers are taking part in the project (*iCnos*, 2016). The teachers in charge of the project from four centers were selected for this study.

## 3. Research questions

As previously mentioned, CNOS-FAP federation is trying to promote and maintain an institutional innovation process with a top-down approach through specific guidelines, but it left each VET center free to independently plan the implementation activities. We think that a better understanding of this process may provide useful information that can be transferred to other similar contexts. On that basis, the main research questions are as follows.

- How can an institutional innovation process foster pedagogical and organizational changes in VET centers?
- Which are the shortcomings?
- How do the shortcomings have been managed by the VET centers?

## 4. Research methodology

A comparative case study has been conducted. The researchers consider this approach as appropriate for comparing different contexts regarding organizations, programs or policies by examining specific cases (Campbell, 2010; Yin, 2009). This methodology has already been used in previous studies to document and discuss the design decisions for educational innovation. Moreover, it has also been used to evaluate benefits and limitations and technology integrated programs or products (Luo, 2015). The comparative case study has been mixed with a grounded theory approach. This methodological choice allowed the researchers to compare different situations maintaining the emerging theory grounded in data (Charmaz, 2006; Glaser et al., 1968).

### 4.1. Data Collection

Four VET centers were randomly selected. The teachers in charge of the coordination of the project of each selected center were interviewed with a semi-structured questionnaire. The questions were structured and reviewed after every conversation with the objective to well investigate the experience made by the respondents in the project (Charmaz, 2006; Sità, 2012). All interviews were recorded and transcribed. Furthermore, project documentation and teaching materials were gathered.

### 4.2. Step 1 – Grounded theory approach

In the first step the analysis followed an iterative, grounded approach (Charmaz, 2006; Glaser et al., 1968). Open coding and axial coding were conducted with the support of Nvivo 11 (qualitative data analysis software). The main objective of the open coding procedure was to identify and conceptualize the main actions undertaken on behalf of the project in the corpus of data. Before coding, every answer were labelled (Mortari, 2007; Tacconi, 2011). The data were coded, compared, merged, and modified without distinction between the different cases (e.g. Table 1). The open coding procedure conceptualized the actions grounded in the respondents’ answers. At the end of the process 35 main actions were identified. (eg. Table 1) (eg. Table 2)

Table 1. Example of open coding.

| Main actions   | Narratives  |
|--|---|
| Focusing the teachers' training both on the use of iPad and on pedagogical aspects | We've learned to use different things, understanding how the device works and understanding how to involve students [*INT3/34]<br>There were both technical training and pedagogical training [*INT1/36]<br>The course was not just on apps, but also on instructional aspects [*INT2/29]<br>We made this choice because we had a transversal training for all the teachers [*INT4/3] |

The main objective of the axial coding procedure was to review all the main actions identified during the open coding procedure and to group them into subcategories and categories (eg. Table 2). These subcategories and categories continued to be explored to improve its density through a constant comparison with gathered data. At the end of the procedure 4 core categories were identified ("Launching the innovation process", "Carrying on the innovation process", "Focusing on instructional practices innovation" and "Facing problems")

Table 2. Example of axial coding.

| Subcategories                    | Main events  |
|----------------------------------|--|
| Launching the innovation process | Favoring the sharing of teachers' experiences during institutional meetings; organizing iPad trainings for the students' parents.<br>Organizing teachers' training prior to the use of the device in the classroom.<br>Focusing the teachers' training both on the use of iPad and on pedagogical aspects.<br>Keep on boosting internet connectivity.<br>Continuing to try new apps and electronic teaching materials. |

#### 4.3. Step 2 – Case comparison

In the second step each case was compared on the basis of the core categories emerged in the first step of analysis. The use of Nvivo 11 software allowed researchers to cross and compare the respondents' experiences with the core categories detected. The resulting data were summarized in a matrix (Table 3). For each case the data were integrated with the gathered information about the VET centers involved in the study. These information were added to the matrix (i.e. professional sectors promoted by the center, project start year, students involved and technological aspects).

Table 3. Overview of the case comparison.

|  | Case 1 (Verona)   | Case 2 (Udine)                                     | Case 3 (Mestre)   | Case 4 (Este)                                  |
|--|---|--|---|--|
| <b>Professional sectors promoted by the center</b> | Electronic, graphic, energy, marble and mechanical.   | Mechanical and Electronic                          | Mechanical, graphic and Electronic  | Tourism, electronic, graphic and mechanical.   |
| <b>Project start</b>                               | 2012/2013   | 2013/2014  | 2012/2013   | 2012/2013                                      |
| <b>Students involved</b>                           | 2 <sup>nd</sup> and 3 <sup>rd</sup> year students.  | 2 <sup>nd</sup> and 3 <sup>rd</sup> year students. | 2 <sup>nd</sup> and 3 <sup>rd</sup> year students.  | All students.                                  |
| <b>Technological aspects</b>                       | Mobile Device Management software not used.   | Mobile Device Management software not used.        | Only some functions of the MDM are used.  | Mobile Device Management software is not used. |
|  | All student bought an iPad (minimum features have been indicated) .   |  |   |  |
|  | Boosting internet connectivity.   |  |   |  |
|  | Several classrooms have been upgraded introducing Apple TV and projectors.  |  |   |  |
|  | Getting support from students' families.  |  |   |  |
| <b>Launching the innovation process</b>            | Gradually involve the professional sectors.   | Gradually involve the classes.                     | Involving all sectors and classes.  | Involving all sectors and classes.             |
|  | Favoring the sharing of teachers' experiences during institutional meetings; organizing iPad trainings for the students' parents. | Identifying reference teachers.                    | Organizing reciprocal observation of teachers' classroom activities; mutually identifying teachers' good practices. |  |
|  | Organizing teachers' training prior to the use of the device in the classroom.  |  |   |  |
|  | Focusing the teachers' training both on the use of iPad and on pedagogical aspects.   |  |   |  |
|  | Keep on boosting internet connectivity.   |  |   |  |
|  | Continuing to try new apps and electronic teaching materials.   |  |   |  |

Table 3. Overview of the case comparison (Cont.).

|   | Case 1 (Verona)  | Case 2 (Udine)   | Case 3 (Mestre)   | Case 4 (Este)   |
|---|--|--|---|---|
| <b>Carrying on the innovation process</b>             | Keeping in touch with the others CNOS-FAP centers involved in the project.   |  |   |   |
|   | Sharing good practices with other VET centers.   |  |   |   |
|   | Organizing teachers' training courses led by internal expert teachers to engage the sectors not included in the project yet. | Favoring the sharing of teachers' experiences during informal meetings.                      | Keeping in touch with external experts and Apple community.   |   |
| <b>Focusing on instructional practices innovation</b> | Putting students at the center of the activity.  | Responding to the teachers' training needs.  | Supporting teachers during the design of teaching activities. | Providing other technological tools (cameras, laptops, etc.). |
|   | Focusing the instructional innovation on professional area.  | Focusing the instructional innovation on general subjects.                                   | Focusing the instructional innovation on general subjects.    | Focusing the instructional innovation on professional area.   |
|   | Focusing teachers' training on instructional practices innovation.   |  |   |   |
|   | Letting teachers free to choose how to use the devices.  |  |   |   |
|   | Continuously improving the technological infrastructure (especially internet connectivity).                                  |  |   |   |
| <b>Facing problems</b>                                | Involving teachers who do not want to use the iPad; organizing trainings for new teachers; capitalizing the good practices.  | Involving teachers who do not want to use the iPad; Looking for spaces and time for meeting. | Economically helping families who cannot buy devices.         | Looking for spaces and time for meeting.                      |

## 5. Discussion

The comparison of interviews and the other gathered data shown that the innovation process has been taking different forms in every VET center context. Nevertheless, the analysis suggests that there are several factors that seems to be crucial in the innovation process investigated: 1) the IT infrastructure efficiency, 2) the pedagogical orientation of teachers' training; 3) the constant linkage and comparison between federation's centers. These factors were compared with similar cases that have been identified through a brief literature review (Franchini, 2015; Giuseppina, 2014). This comparison seems to confirm the central role of pedagogical orientation and instructional practices. Moreover, the efficiency of IT infrastructure is important (i.e. devices, internet connectivity etc.), but it should be an indispensable prerequisite without which the process of innovation cannot take place. Furthermore, the infrastructure seems to include not only the IT elements, but also the supporting and updating actions offered to the teachers. In other words, the process of educational innovation seems to involve people (teachers, students, parents and managers) who change their practice and their routines on the basis of an efficient organizational infrastructure. The cases identified in the brief literature review that have been used for the findings' comparison of this study are related to quite small settings (i.e. single schools or single classrooms). Conversely, the *iCnos* project involves a wider number of VET centers, classrooms, and actors: the constant linkage and comparison between federation' centers (third crucial factor detected) and the freedom of management of each center seems to allow to the *iCnos* project to be applied in a wider context.

## 6. Conclusions

The main results of this study (reported in the matrix – Table 3) represent a set of suggestions that could be taken into account by the CNOS-FAP federation when the *iCnos* project will be extended to all the federation centers. However, the research project is in an exploratory phase yet. Because of this, it was not possible to completely answer to all the research questions. In order to achieve a better comprehension of the whole process, more data need to be gathered. This will allow to complete the Grounded theory procedure and outline a theoretical framework about “innovation processes management in wide education contexts”. Moreover, a collection of well defined instructional best practices would be helpful for, but not limited to, the teachers involved in the research project

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# EFFECTS OF THE NEONATAL HEARING SCREENING PROGRAM IN A SCHOOL FOR HEARING IMPAIRED IN TURKEY

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## Abstract

The present study aims to evaluate the effects of newborn hearing screen program on the age of diagnosis, age of hearing aid fitting and age of starting an intervention program of children who have a hearing loss. For this purpose the files of children who attend a special for hearing impaired were evaluated. The files covering the years between 2000-2015 were scanned to collect data. The findings indicated a significant decrease in the age of diagnosis after 2010 but there are still problems in initial age of early intervention and hearing aid fitting.

**Keywords:** *Deafness, neonatal hearing screening, age of diagnosis, follow-up.*

## 1. Introduction

Deafness without early and appropriate management has very serious consequences for the affected child and his/her family, as hearing during the critical periods of infancy and early childhood is necessary to develop spoken language. Before the implementation of newborn hearing screening programs, children with profound bilateral sensorineural hearing loss were usually identified around 2 years of age or even older. Early detection and intervention are believed to be critical steps toward proactive management of these children. Recent technological advances allow for identification of hearing loss soon after birth, and most of the developed countries have started hearing screening programs worldwide throughout the 1990's (Uus and Bamford, 2006; Tattersall ve Young, 2005; Vhor, et. al., 1998).

## 2. Method

The clinical and educational files of deaf children who were born between 2000-2015 were scanned retrospectively. 935 files were evaluated. All children had tested in the audiology clinics of the same school. The data on the age of diagnosis, hearing aid fitting and the initial age of early intervention were gathered. The mean value for each item were calculated for each year.

## 3. Findings

The mean ages for diagnosis, hearing aid fitting and initial age of early intervention were presented in Table 1.

*Table 1. Mean ages for diagnosis, hearing aid fitting and early intervention.*

| Year | Age of diagnosis*                        | Age of hearing aid fitting*                | Age of starting early intervention *     |
|------|--|--|--|
| 2000 | $\bar{X}$ =42.3<br>Range= 9- 130<br>N=63 | $\bar{X}$ =41.03<br>Range= 12-120<br>N= 52 | $\bar{X}$ =35.09<br>Range= 12-86<br>N=52 |
| 2001 | $\bar{X}$ =44.9<br>Range=0.5-90<br>N=102 | $\bar{X}$ =36.6<br>Range=7-90<br>N=94      | $\bar{X}$ =32.6<br>Range=13-88<br>N=49   |
| 2002 | $\bar{X}$ =32. 1<br>Range=5-144<br>N=71  | $\bar{X}$ =46.5<br>Range=8-144<br>N=64     | $\bar{X}$ =32.7<br>Range=9-76<br>N=35    |
| 2003 | $\bar{X}$ =31<br>Range=6-72<br>N=68      | $\bar{X}$ =32.9<br>Range=8-96<br>N=56      | $\bar{X}$ = 36.2<br>Range=12-112<br>N=39 |

Table 1. Mean ages for diagnosis, hearing aid fitting and early intervention (Cont.).

| Year | Age of diagnosis*                       | Age of hearing aid fitting*             | Age of starting early intervention *   |
|------|---|---|--|
| 2004 | $\bar{X}$ =23.1<br>Range= 1-106<br>N=91 | $\bar{X}$ =23.5<br>Range=2-67<br>N=77   | $\bar{X}$ =28.0<br>Range=7-71<br>N=56  |
| 2005 | $\bar{X}$ =22.2<br>Range=4-106<br>N=73  | $\bar{X}$ =24.6<br>Range=6-78<br>N=65   | $\bar{X}$ =26.3<br>Range= 3-74<br>N=47 |
| 2006 | $\bar{X}$ =28.3<br>Range= 3-104<br>N=61 | $\bar{X}$ =30.2<br>Range=4-72<br>N=54   | $\bar{X}$ =25.3<br>Range=5-47<br>N=30  |
| 2007 | $\bar{X}$ =21.5<br>Range= 1-85<br>N=67  | $\bar{X}$ =21.9<br>Range=2-90<br>N=60   | $\bar{X}$ =28<br>Range=2-100<br>N=41   |
| 2008 | $\bar{X}$ =24.1<br>Range=1-52<br>N=70   | $\bar{X}$ =18.6<br>Range=3-55<br>N=65   | $\bar{X}$ =20.6<br>Range=<br>N=52      |
| 2009 | $\bar{X}$ =13.9<br>Range=1-41<br>N=57   | $\bar{X}$ =14.8<br>Range=1-42<br>N=49   | $\bar{X}$ =15.9<br>Range=4-56<br>N=40  |
| 2010 | $\bar{X}$ = 10.3<br>Range=1-48<br>N=59  | $\bar{X}$ =14.4<br>Range=2-48<br>N=51   | $\bar{X}$ =16.3<br>Range=2-48<br>N=44  |
| 2011 | $\bar{X}$ =6.8<br>Range=1-39<br>N=48    | $\bar{X}$ =11.8<br>Range=2-57<br>N=46   | $\bar{X}$ =13.3<br>Range=2-50<br>N=36  |
| 2012 | $\bar{X}$ =10.45<br>Range=2-43<br>N=43  | $\bar{X}$ =15.2<br>Range=3-45<br>N=37   | $\bar{X}$ =14.8<br>Range=3-38<br>N=30  |
| 2013 | $\bar{X}$ =9.5<br>Range=2.5-27<br>N=29  | $\bar{X}$ =10.1<br>Range=2.5-27<br>N=29 | $\bar{X}$ =12.5<br>Range=4-42<br>N=27  |
| 2014 | $\bar{X}$ =6.28<br>Range= 2-16<br>N=14  | $\bar{X}$ =6.1<br>Range=3-10<br>N=15    | $\bar{X}$ =8.8<br>Range=4-16<br>N=16   |
| 2015 | $\bar{X}$ =5.1<br>Range=1-10<br>N=19    | $\bar{X}$ =8.3<br>Range=2-10<br>N=18    | $\bar{X}$ =8.3<br>Range=4-24<br>N=15   |

\*Age in months

Table 2 demonstrates the percentage of children who were diagnosed, fitted and started early intervention by years.

Table 2. Percent values for diagnosis, hearing aid fitting and intervention before 6 months of age.

| Year | Diagnosis before 6 months. | Hearing aid fitting before 6 months | Intervention before 6 months |
|------|----------------------------|-------------------------------------|------------------------------|
| 2000 | none                       | none                                | none                         |
| 2001 | % 6.8                      | none                                | none                         |
| 2002 | % 4                        | none                                | none                         |
| 2003 | none                       | none                                | none                         |
| 2004 | % 5                        | none                                | none                         |
| 2005 | % 2.7                      | none                                | none                         |
| 2006 | % 4.9                      | % 3.7                               | none                         |
| 2007 | % 17.9                     | % 10                                | % 2.4                        |
| 2008 | % 27.1                     | % 9.2                               | % 5.7                        |
| 2009 | % 26.3                     | % 18.3                              | % 15                         |
| 2010 | % 40.6                     | % 29.4                              | % 34                         |
| 2011 | % 56.2                     | % 41.3                              | % 19.4                       |
| 2012 | % 46.5                     | % 24.3                              | % 16.6                       |
| 2013 | % 34.4                     | % 13.7                              | % 7.4                        |
| 2014 | % 42.5                     | % 40                                | % 12.5                       |
| 2015 | % 63.1                     | % 50                                | % 20                         |

As it is seen in table 1 and 2 there is a gradual decrease in age of diagnosis, hearing aid fitting and starting intervention. However it can also be seen in the table 1 and 2 there is a significant gap between the age of diagnosis and the mean age in starting early intervention. The intervention still starts after the 6 months of age for the majority of the babies.

#### 4. Discussion

The findings of this study indicates a significant decrease over the years in early diagnosis. The percentage of the the children who were diagnosed before the age of 6 months were 63% in 2015 while it was none in 2003. The mean age for diagnosis was 42 months in 2000 and 5.1 months in 2015. These were encouraging results showing the success of the neonatal hearing screening program in Turkey (Şipal ve Bayhan, 2010; Vehapoğlu-Türkmen et al., 2013; Yılmaz vd.2016). However it can not be asserted for the age of hearing aid fitting and intervention age. 2015 data indicated that average age of fitting the hearing aids and age for intervention was 8 months old. Although mean ages decreased before 12 months of age, they are still below the expected average. These findings were in agreement with data reported from various centers in Turkey (Vehapoğlu-Türkmen et. al., 2013; Yılmaz vd.2016). The mean age for hearing aid fitting and starting in an early intervention program was reported as 3 months of age in EU countries and in the USA (Aurelio and Tochetto, 2010; Canale et. al., 2006; Dalzell et. al., 2000)

Our preliminary analysis implies that mild to moderate degree of the hearing loss; auditory neuropathy; the multiple disabilities of the child and economic difficulties of the family might have caused the delay in fitting of hearing aids and late start in intervention programs. They may also explain the lost the follow up cases after the diagnosis.

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## **EURO4SCIENCE 2.0: SPINOFF OF A FORENSIC SCIENCE EDUCATIONAL STRATEGY**

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### **Abstract**

Euro4science 2.0 is a spinoff of Erasmus + KA2 "Euro4Science". We propose to explore students interest in crime scene based television series as an educational strategy towards students motivation to school, minimizing early school leaving. In version 2.0 not only a forensic educational kit is disseminated through a network of trained teacher's from six participating countries but also interdisciplinarity is enhanced by extending the experimental activities in order to include the values of European citizenship from human rights to environmental sustainability and health education.

**Keywords:** *CSI Effect, Euro4Science, Refugees, Transdisciplinary.*

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### **1. Introduction**

Following the Europe 2020 strategy of reducing early school leavers a strategy of applying forensic sciences to improving young people's interest in scientific and technological areas, a previous Erasmus + project was implemented – Euro4Science- which included an educational “forensic” toolbox that has been used in four European countries.

Euro4science 2.0 is a spinoff of Erasmus + KA2 "Euro4Science": exploring students interest in crime scene based television series (“CSI: Crime Scene Investigation”; “Bones”, etc.) by developing real and fictionalized forensic case files supported by a tool box of experimental activities to be used in classroom. In version 2.0 interdisciplinarity is enhanced by extending the scope of experimental activities in order to include the values of European citizenship such as human rights, tolerance, non-discrimination, along with environmental sustainability and health education.

The Euro4Science 2.0 also became more comprehensive in terms of participating countries. Adding Greece and Turkey to the previous partnership of Portugal, Bulgaria, Poland and UK strengthened the potential of this forensic based approach to address the present refugee question, one top priority of European concerns.

Experimental activities included in the educational toolbox of Euro4science 2. are based in "Case Files" supported by a detailed storyline and a scope of lab and field activities with a complementary video library.

Teacher's involvement in Euro4Science 2.0 is backed by training workshops and a network of identified hotspots that further disseminate locally the use of the educational toolbox.

### **2. Forensic Science Educational Toolbox (Version 2)**

The Forensic Science Educational Toolbox (Version 2) is an improved and scaled up (several units are distributed among selected schools) of the previous (prototype) Forensic Educational Toolbox developed under Euro4Science. This improved 2.0 version expands the application of the activities to new fields, such as health, environment and societal values of non-discrimination and human rights. This is an educational kit designed and developed to be used by students under teachers' supervision. In this kit, students can find different materials that allow them to perform several activities related to Forensic Sciences adapted to high school context, bearing in mind the respective school curricula. The activities proposed enable teachers to educate and inspire their students in the principles of scientific inquiry, analysis and creative thinking.

This forensic educational kit consists of a main box with materials and several support documents:

- **Toolbox:** a box containing materials that allow the simulation of crime scene analysis techniques to be used as a pedagogical and scientific basis in the classroom. All materials of the Toolbox are inexpensive, recyclable and can be complemented by the resources available in schools.

- **Students Guide:** a working manual for the implementation of the activities, including guidelines for the use of material in a classroom context or other environments, such as science clubs, youth groups, etc. These activities are associated to learning contents, addressing scientific concepts adequate to each education level.

- **Teachers Guide:** a manual that includes detailed guidelines for the use of the Toolbox in a classroom context. Specific lessons that join different activities are proposed, with the possibility of shortening or widening the length and level of lesson.

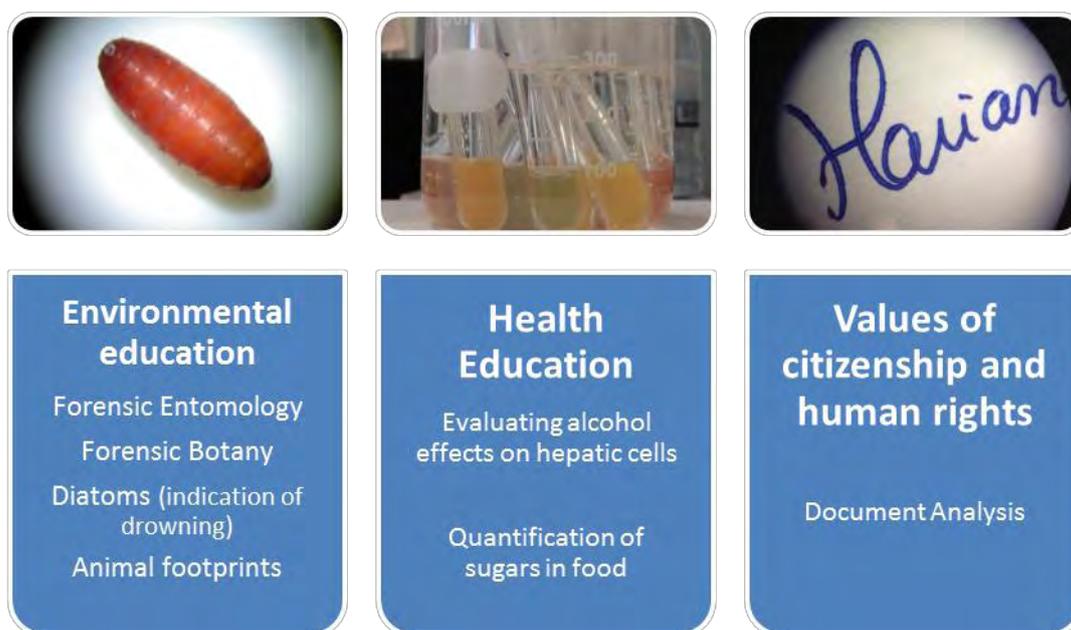
The proposed activities are supported on one fictitious crime case. This case consists in suggestions of integrated skills around a story, using the resolution of the problem/mystery and complemented with the discussion of the sociological implications with students.

The Forensic Science Toolbox allows and encourages students to explore different topics related to Chemistry, Physics, Biodiversity, Genetics and Science in general, promoting interdisciplinarity as well as the interconnection to societal challenges.

After a review of potential forensic experimental activities capable of meeting educational requirements, selected activities are subjected to lab tests at the Applied Genetics Laboratory in the Department of Biology, University of Aveiro, Portugal.

Experimental activities are also monitored by assessing the degree of realisation during school visits to university labs.

Figure 1. Lists the tested activities, corresponding to three large core areas.



### Proposed Experimental Activities

#### Environmental Education

##### Forensic Entomology

The use of insects is important for criminal investigations as they are the first to find the dead body and they are present in all stages of decomposition. The ecological sequence of colonization of the corpse is also used for the estimation of the time elapsed after death in cases of longer *post mortem* intervals (Caneparo et al., 2012).

The experiment consists in monitoring the succession of different corpse decomposition stages exploring insect's life cycles and its use in forensic science. An illustrated catalogue includes insect's images accompanied by biological data that enables students to classify insects.

##### Forensic Botany

Forensic palynology is the application of pollen and spores in solving legal issues. Pollen and spores can be obtained from an extremely wide range of items, including bodies. This organic material

provide clues as to the source of the items and the characteristics of the environments from which the material came (Mildenhall et al., 2006).

Considering this, the aim of the experiment is to prepare and observe different pollen grains corresponding to distinct ecosystems. Students will understand the evidence value of palynology while comparing traces that show biodiversity. An illustrated catalogue includes pollen images accompanied by biological data that enables students to essay a taxonomic classification of the specimens.

### **Diatoms**

Diatoms are unicellular aquatic algae that grow in almost all natural environments, such as rivers, streams and seas. They have characteristics that are useful for species identification. Many species are habitat-specific due to their sensitivity to environmental variables such as temperature and salinity. These have been studied in cases of drowning and in the identification of the respective place of death (fresh or salt water) (Uitdehaag et al., 2010).

The experiment consists in observing two definitive preparations of different water samples (fresh and salty water), analyzing the different diatom genera and comparing them with a supplied sample (from the corpse).

### **Animal footprints**

Footprints are important traces that can be found at the crime scene since they allow to reconstruct the events of the crime as well identify source species. This may also be relevant to determine whether the body has been moved from the crime scene (Sebastiany et al., 2013).

The experience consists in comparing plaster models of footprints from different species and understanding their relevance in the environment.

### **Health Education**

#### **Evaluating alcohol effects on hepatic cells**

Alcohol is currently one of the main health concerns in modern society, so it becomes crucial to make students aware of alcohol effects on human body cells.

In this experiment tissue damage and dehydration of hepatic cells (from pork and cow liver) is evaluated under different concentrations of ethanol. This evaluation uses a colorimetric test (resazurin) that will estimate cell viability, and evaluated also by the physical measurements of the liver sections before and after exposure to ethanol.

#### **Quantification of sugars in food**

Childhood obesity including high levels of sugar consumption among students has become an important health concern. The experiment consists in evaluating the sugar content of common food/drinks applying both qualitative (through a color scale) and quantitative (through the amount of precipitate) methods using Benedict reagent.

#### **Values of Citizenship and Human Rights**

Documentation is the area of forensic science that deals with the analysis of documents whose genuineness is questioned.

In the experiment proposed students analyse both different inks (by a chromatographic technique) and handwritings. The integration of lab experiments with interdisciplinary approach over societal values and human rights is explored in the context of the fictionalized forensic case file.

## **3. Teacher's workshops**

After the planning, design and optimization of the Forensic Science Educational Toolbox version 2.0 and following initial evaluation of student's performance on their visits to the University, the educational kit is presented and tested by teachers of different subjects and school years.

The Toolbox presentation of the consists of 5-day practical workshops in six countries (Portugal UK, Bulgaria, Poland, Turkey and Greece). Refuges will be addressed by integrating teachers involved directly in refugee education activities.

Figure 2. Students testing Euro4Science 2.0 activities.



#### 4. Forensic Science Festivals

The Euro4Science 2.0 project also contemplates Forensic Science Festivals, science fairs where students from each country present their forensic-inspired education projects to an audience of teachers, students and the community.

The Forensic Science Festivals in Portugal, United Kingdom and Turkey, involve an exchange of 10 students and 2 teachers from each country. For the period of one week, students participate in various activities and present the socio-cultural context of each country along with their experience in the use of the Forensic Science Toolbox in the classroom context during the school year as well as new contributions from their initiatives of inspired forensic like activities.

#### 5. Conclusion

The development of a forensic-inspired educational Toolbox (integrated within the European Erasmus+ Project Euro4Science 2.0) with a close integration with school curricula and educational objectives constitutes an opportunity to use an educational tool with highly engaging content, multiple possibilities of interdisciplinary exploration, and capable of reaching and motivating students at various levels of education.

The use of the Forensic Science Educational Toolbox Version 2 does not require special technological resources, allowing it to be used in a variety of school environments. The project strategy is also based in the involvement of teachers in the evaluation and improvement of the proposed activities through training actions (workshops).

The Forensic Science Educational Toolbox version 2 can be complementary to other educational resources, contributing to minimize the indifference and dropout of students in critical ages, and contributing to the motivation of teachers. This improved version will expand the application of the activities to new fields, such as health, environment and societal values such as non-discrimination and human rights.

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Euro4Science website: <http://euro4science2.eu/>

Euro4Science Facebook page: <https://www.facebook.com/euro4science/>

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## EFFECTIVE PRACTICES PROMOTING ABORIGINAL COMMUNITIES' SCHOOL SUCCESS

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### Abstract

Canadian statistics concerning First Nations still portray communities that struggle to realize their full potential in society. This situation led us to question the systems' success conditions which seem to generate a positive dynamic with regard to the aboriginal students' school success. We carried out a synthesis of knowledge, specifically in countries where the presence of indigenous communities is important (Australia, New Zealand, Canada, USA, Denmark, Sweden, Norway, Finland), in order to examine the modalities of organization of the education system and the practices implemented in classrooms which promote the school success of Aboriginal students. From the perspective of the education system organization, results show that an emancipatory approach is associated with better school success among Aboriginal students. This emancipatory approach requires the recognition of Aboriginal language as one of the country's official languages, the availability of services provided in the Aboriginal language, and bilingual education programs at all school levels. The pedagogical practices that seem to contribute most to Aboriginal students' school success subscribe to the same type of emancipatory approach. In addition to providing a critical analysis of these practices, we will identify avenues for action that would contribute to reducing the discrepancies currently observed between Aboriginal students and those of majority communities in Canada.

**Keywords:** *Aboriginal communities, secondary socialization, school success, emancipatory education, effective practices.*

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### 1. Background

Canadian statistics concerning First Nations still portray communities that struggle to realize their full potential in society. Thus, from a social perspective, significant differences exist between Aboriginal communities and Anglophone or Francophone majority communities, measured in terms of employment and income levels (Statistics Canada, 2013). Data which pertains to schooling also demonstrate important delays for Aboriginal communities compared with the majority community (Rhodes, 2011; Statistics Canada, 2013; Tunison, 2007). A rapid analysis of the international context shows that, unlike Canada, some countries seem to have succeeded in reversing the trend. For example, since the early 2000s, Australia, New Zealand and Norway have seen significant reductions in the gaps between Aboriginal communities and the rest of the population, both in terms of schooling and employment (Statistical data from the Governments of Australia, New Zealand and Norway). This situation led us to question the systems' success conditions which seem to generate a positive dynamic with regard to the aboriginal students' school success.

### 2. Conceptual Framework

Research has identified several factors which could explain the existing gaps between Aboriginal and majority communities. These include social factors (insufficient financial resources, incidents of racism, a sense of exclusion, etc.), environmental factors (remoteness and geographical isolation) and factors related to schooling (lack of academic preparation, lack of self-esteem and motivation, maladjustment to the indigenous culture of institutions and educational programs inherited from a historical project of assimilation, absence of positive examples in their community) (Friesen & Krauth, 2011; Tunison, 2007). However, if social and environmental factors are well documented, school factors

have not been extensively analysed. Two main dimensions are generally considered: orality as a major characteristic of Aboriginal learning (Canadian Council on Learning, 2009) and the situation of diglossia.

While language and cultural identity represent recurring challenges for Aboriginal communities and seem to have a significant influence on the social trajectories of their members (Nakata, 2007), these factors appear to be little taken into account in schooling (Canadian Council on Learning, 2009). This leads us to explore the dynamics between the socialization received in the family context (primary socialization) and the one acquired in school (secondary socialization) (Berthoud-Aghili, 2002; Gayet, 1998; Kanu, 2007; Levasseur, 2012; Verhoeven, 2005) in order to explain how school can support the socialization process of these students and identify the practices that teachers implement to promote secondary socialization.

Our project is based on the concept of socialization, declined according to different theoretical approaches. Defined essentially as a “process by which the child is required to act and think in accordance with a social system, or [...] the process by which the child adapts to that system” (Gayet, 1998, p. 23, free translation), socialization has significant effects on the identity construction process of youths (Abdallah-Preteuille, 1997; Dubar, 2000). This is especially true when it comes to young members of indigenous communities, where there frequently are very important gaps between the primary socialization, received in the community, and the secondary socialization, acquired in school (Hohl et Normand, 1996; Piquemal & Bolivar, 2009; Verhoeven, 2005).

In examining socialization as a process of social construction of reality, Berger and Luckmann (1996) find that “the individual belonging to society [...] simultaneously exteriorizes his own being in the social world and internalizes it as objective reality. [...] the individual, however, was not born a member of a society” (p. 223, free translation). Consequently, the individual initially passes a first socialization, “primary socialization”, where he interiorizes representations of a specific environment. In this sense, the family is conceived as an agent of primary socialization. Thus, the child is able to consider that “the “outside” reality corresponds to the reality “within”” (*Ibid.*, p. 229-230, free translation). Secondary socialization, on the other hand, characterizes the later internalization taking place in the biography of the individual, conceived as a member of a prior environment and having internalized its norms, values and roles. In this sense, secondary socialization is, according to Berger and Luckmann (1996), “the institutionalization of “sub-worlds”, which are institutional or based on institutions. Its extent and characteristics are therefore determined by the complexity of the labor division and social distribution” (p. 236, free translation). In this sense, we consider the school as a secondary socialization agent.

For the purposes of this research, we have focused specifically on secondary socialization through teachers' practices, while taking into account the orientations of the school system and the social context in which the practices are used. Our conceptual framework is also based on the five categories of socialization practices identified by Steichen (2014), but supplemented by an emerging research posture, which gives space to the categories retrieved from the analysis.

### 3. Methodology

This knowledge synthesis was conducted according to the methodological suggestions of Grimshaw (2008), Noyes *et al.* (2008), Petticrew and Roberts (2005) and Pope *et al.* (2007). It included three types of documents: policies and regulations from several decision-making levels (government, school boards and equivalent structures), professional texts and scientific texts of countries with significant Aboriginal presence (Australia, New Zealand, Canada, United States, Denmark, Finland, Norway and Sweden), professional texts (25 were retained) and scientific texts (147 in total, including 40 dissertations and theses). This corpus was first subjected to a content analysis, which initially gave rise to individual narrative syntheses. Then, thematic groupings were carried out as well as cross-analyses between the different categories of texts. These methods allowed us to identify the socialization practices considered to be the most successful and to relate them to their political context of implementation.

## 4. Results

### 4.1. Official discourse

Some countries place emphasis on the valorization of the Aboriginal communities' native language and culture, which also implies the official recognition of their mother tongue. For example, Norway recognizes the Sámi language as the second official language of the country. Education is therefore offered either in Sámi or bilingual to children from this community. Maori is also recognized among the three official languages of New Zealand, and the children who belong to this community are entitled to education in Maori or bilingual. In Finland, although the Sámi language is not recognized as a national language in the same way as Finnish and Swedish, the Sámi community can nonetheless choose to

receive public services, including education, in their mother tongue. Aboriginal children in Australia also have the right to be enrolled in their native language at the elementary level.

However, no Aboriginal language is officially recognized in Canada. The high number of Aboriginal languages spoken, in Canada in general and in Quebec more specifically, would make such a policy very difficult or impossible. On the other hand, the implementation of bilingual programs in public schools seems to be an avenue to explore. In band schools managed by band councils and under federal jurisdiction, children from Aboriginal communities can attend elementary schools where education is provided in their native language. In Quebec, on the contrary, students who attend one of the public schools established in an Aboriginal community receive education only in one of the two official languages (English or French).

For their part, countries that have implemented bilingual education programs have seen an increase in the number of qualified Aboriginal teachers (e.g. Norway). Some countries and Canadian provinces have put in place an intercultural perspective, which has concretised mostly through the implementation of an adapted curricula integrating Aboriginal cultures (e.g. British Columbia, in Canada, Norway and Finland). This approach is sometimes supplemented by measures to empower Aboriginal communities, such as self-management or special education programs.

#### 4.2. Professional literature

Our corpus analysis enabled us to group results according to four dimensions: pedagogy, extracurricular activities, links between school and community and inclusive curriculum. From the point of view of the pedagogy, differentiated approaches (Wotherspoon, 2016) as well as teaching practices which promote active reflection in relation with the traditions of the community (McKachnie, 2015) seem promising. We also found that extracurricular activities should be favored in general (St. Denis, 2010), and especially for science education (Fazio, 2016). Finally, the following avenues have been associated with the development of stronger ties with the community: recognizing the role of elders in traditional education, integrating traditional ways, practices and knowledge (Fazio, 2016; Parent, 2016; Wotherspoon, 2007) and including Aboriginal perspectives in the curriculum, which can help make sense of education (St-Denis, 2010; Harris, 2016).

#### 4.3. Scientific literature

Several socialization practices and approaches were also retrieved from our corpus of scientific literature, which we grouped in four categories:

(A) *Reducing the cultural gap between teaching approaches*: through the implementation of a holistic approach, which reinforces the sense of belonging both to the native community and to the host community (Dockett, 2007) or by integrating native culture and values (Frigo, 2004; Purdie, 2011; Yektingtyas-Modouw, 2013) and traditional activities, such as the production of a book on nutrition, providing first aid using plants, etc. (Godinho & Woolley, 2014).

(B) *Improve Aboriginal students' relationship to the language of instruction*: by valuing native languages (Chandler, 2008; Ketsitlile, 2013; Laguarda & Woodwar, 2013; Phyak, 2013; Wigglesworth & Billington, 2013), through the use of activities which support creativity by integrating cultural elements (Pietikainen & Pitkanen-Hyhta, 2013; Thanagan, 2015), through bilingual learning (Pacific Voices project : Skouye, 2007; Pacific Voices project : Osborne, 2011), or by offering education of certain school disciplines in native languages (Mathematics: Borden, 2010; Nichol & Robinson, 2000).

(C) *Value the native culture and build bridges between the two cultures*: through the participation of Aboriginal students in a non-Aboriginal learning context (Ashton-Hay, 1996; Osborne, 2011) (Fenwick, 2012; Warren, 2009), through the use of differentiated approaches (Fenwick, 2012; Warren, 2009) or by encouraging community engagement (Anthony-Steven, 2012; Asapass, 2009, Ashton-Hayk, 1996; Butt, 2014).

(D) *Give meaning to school learning*: by decompartmentalising" schools and opening it up to the community (e.g. cultural expeditions: Aguilera, 2013; intercultural approach to science: Aikenhead, 2002), through the integration of traditional cultural elements into the curriculum, such as music and arts (Faulkner, 2010; Moore, 2013; Nalder, 2009; Palmer, 2014), by reconciling the perspectives of the community and the school (Boon, 2006; Bromfield, 2005; Purdie, 2011), by focusing on the emotional dimension of learning, which can imply showing interest for the students (De Bortoli & Cresswell, 2004), fostering a positive self-image through peer support and the use of questioning technologies (McAuley, 2009) or using a collaborative approach (Wilkinson & Bradbury, 2013).

## 5. Conclusion

In general, the socialization practices identified seem to have significant effects on school learning, on student behavior, and on school-family-community links. Moreover, these can have a positive influence on the identity development and the emancipation of minority communities. In light of these results, we suggest the experimentation of bilingual education programs for Aboriginal communities in Canada and the promotion of an emancipatory educational approach. We thus recommend teachers to focus on approaches that are emancipatory, active, collaborative, differentiated and/or project-based, by exploiting the affective dimensions of learning, "decompartmentalising" the classroom through activities that are open to the community, and experimenting with projects in which communities are actively involved, especially the elderly.

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# USING GOOGLE CLASSROOM TO REINVENT SCIENCE EDUCATION

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## Abstract

Incorporating “Google.classroom” transformed the way students learn and how Science teachers teach in several significant ways. First, management of classwork and homework became almost completely paperless. Then a flipped classroom model was easily incorporated along with other innovations. However the biggest change occurred when our students began to use animation, both professionally produced and then student generated. Instead of communicating exclusively via written means, students began using animation. Ultimately a culture of animation emerged though out the entire school.

*Keywords: Google.classroom, technology, science education, animation.*

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## 1. Introduction

In the United States, many states including California have adopted the “Next Generation Science Standards,” (NGSS) whereas in the past, each state had their own Science Standards. This has brought some positive changes to Science Education, such as an emphasis on critical thinking, hands-on activities in which students “engineer” solutions to real life problems. But this change has introduced uncertainties as well, especially for California teachers. For one thing there is as yet no textbook. Educators have had to guess what exactly they should be teaching and emphasizing. For many science teachers, this is problematic since there has traditionally been a reliance on textbooks to guide both curriculum and instruction, which were tied to California State Standardized Testing. This change of standards represents a very different way of teaching from the usual manner of instruction, and since it is still quite new, there is inherent confusion about how to do it. Furthermore, many of these Science teachers teach Mathematics and Science, in which they have a set of students for a block of two periods. Their primary interest has always been much more focused on their Math teaching and not so much on Science, due to the fact that schools are evaluated on Math and English Language Arts (ELA) standardized test results. It was not just the teachers, but the school administrators as well that had this attitude. For these teachers, many times the default mode was to borrow time from the Science period to teach more Math. Then, if they did teach Science, they would use the textbook almost exclusively, resorting to the most dull form of teaching – assigning students pages to read and questions to answer from the textbook and assorted resource materials. In such classrooms, few if any experiments were conducted, neither were there many explorational activities nor “Project Based Learning” (PBL) opportunities.

Because our school district is in a high poverty, mostly Latino area, with many immigrants, we wanted to ensure that our students had a much better experience with Science education than that. As well, we wanted to incorporate as much 21<sup>st</sup> Century learning as possible. For this student population, boosting their facility with technology and their academic achievement at school, during the school day is more even more essential than it might be in a more affluent area. Many of our students have only one parent at home or their parents are working several jobs and are absent from the home a great deal of the time or, even in prison. Frequently, their parents do not understand how the education system works in the United States, nor how important it is to come away from their public school experience “university or career ready.” An attitude of positive expectation for academic achievement is often missing for many of our students because of the low level of academic achievement of many parents. If they are to pick up the message that they could or should go to the university, it is instilled during their school day and from the educational professionals there. So maximizing our students’ academic attainment and progress during the few hours of the school day is viewed to be of the highest priority. Under the old traditional

system it was clear that we were not achieving this goal to the best of our ability. Evidence for this showed up in the results from State Standardized Science Test Scores.

The problem was three fold. First was how to embrace and incorporate the new standards in a way in which it was as effective and as easy as possible to implement for both students and teachers so it would not detract from the Math focus. Next was to utilize as many online and other resources until such time as a textbook and more defined expectations came out, if one ever did, which would be adaptable and compatible with them. Finally, Science teachers did not want their subject to be the unwanted stepchild of the academic spectrum, but wanted the importance of and interest in Science to be elevated. To accomplish these goals, the Science Department set about to incorporate “Google Classroom,” and other technology “apps,” after investigating available options. In this paper this journey and the results are shared.

## 2. Research

Research shows that technology enhances student engagement in almost any situation. One researcher discovered that increasing the interactivity of online and traditional instruction had a profound, positive impact on student engagement in a business statistics course Kim (2011). Indeed, he found that interactivity was more of a key to increasing student engagement than simply going online. In a survey of schools using the Google suite of “apps”, they found a higher level of student engagement, as demonstrated by a higher level of subject matter mastery Cortez (2016).

In the Philadelphia, Pennsylvania area of the United States, several school districts opted to use exclusively online content and not buy textbooks at all Bocella (2017). They reasoned that these books were expensive at roughly \$100 USD each, and obsolete before the printing presses had even finished printing them. Students were instead issued inexpensive laptops and all reading, homework and other work was done using online, free resources. The result was a greater level of student engagement with demonstration of a subsequent higher level of mastery. Many found that using the Google suite of “apps” was also a way to reduce costs while improving student engagement.

In Chicago public schools, teachers brought in “Google Classroom” surreptitiously, without district approval because it was so simple and inexpensive to use. Singer (2017) With “Google.classroom” there is nothing to buy such as a site license to acquire as is the case with the Microsoft Office Suite. Later on, Chicago Public schools became a laboratory for Google in which to try out what worked in education for the Google Corporation. The “Google Chromebooks” are inexpensive with prices as low as \$159 usd, plus the suite of apps, which are also free so school districts looking to economize. Just for cost savings alone, this made sense. But students also benefitted from a more 21<sup>st</sup> century approach to learning. After all, even in economically depressed areas students often have access to electronic devices such as smart phones and student as well as adult affinity to these devices seems to be almost ubiquitous. In the end student engagement as well as teacher preference for Google Classroom has led it to almost overtake public education in many parts of the United States.

## 3. Background

In the “Google.classroom” system, a district or other entity begins to set up by establishing an “intranet,” by choosing and setting a domain name. For instance, ours is “@lennoxk12.org.” All “Gmail” accounts within the intranet for our district have this address. All teachers and students are assigned a “Gmail” account within this intranet. Once teachers open the account set up for them by the district, they are able to instantly access “Google.classroom” and set up “classes.” Once the class is established, a six or seven letter/number code comes up with which students may “join” that class. After they do so, the teacher has a complete list of all the students and their identity in that class. Gmail accounts, which are not part of the district intranet cannot join a class. Only those with the correct intranet domain name may join. For instance, Joe\_Joe@gmail.com would not be able to join our intranet. Students or others who have “Gmail” accounts are likewise excluded unless the domain name is ours.

Teacher privileges are different than student privileges. Our students’ addresses all begin with their student identification number followed by the domain name, as in 12345@lennoxk12.org. The teachers’ “Gmail” addresses are set up differently, as in john\_jones@lennoxk12.org. This way, teachers can set up classes, invite other instructors, share documents, edit, etc. Student accounts are limited as to how much sharing, comments and editing are allowed. This amount of sharing is controlled by the teacher of that class. Access to and transmission of emails to outside of the intranet are also limited. Teachers can email anyone anywhere about anything from their “Gmail” accounts, while student account are deliberately restricted to intranet use only. Neither can they receive email from outside the intranet.

Once a class has been established, the teacher can instantly assign and post assignments. All students in the class, when they log on, see the post. Depending on the requirements of the assignment, they can do all of it online and then turn it in online. After submitting assignments, the teacher can instantly tell how many of the students and who specifically have submitted it. For instance, if the assignment is to make a “Google.slide” presentation (similar to the presentation software, “Microsoft PowerPoint”), when the teacher opens up that class he or she can tell that twenty- five students have turned theirs in while ten have not. Then by clicking on the “25”, a listing of all the presentations submitted show up with a tiny version of the first slide of each student’s presentation along with their name. If that computer is connected to a projector, then each of those students may present directly from that roster by clicking on their own presentation.

For the students who have not yet submitted their assignments, the teacher can instantly email a reminder or post one for them. The instructor can also send out reminder messages or emails to the entire class or to just certain students.

One of the many attractive features about “Google.classroom” is the ability to grade, share and edit student work online. Teachers can make comments and edits of individual student’s work. They can also post a grade. Sharing of documents can be done through “groups” or directly with assignments and in several other ways. So a group of students or teachers can edit each other’s work, work on a group assignment together, or comment about work already done, or have a class discussion all online.

One really handy aspect of Google classroom is the ability to create formative and summative assessments using “Google.forms.” These tests can include video clips, static images, and other interactive features. A quiz or test as it is being written also has the answer key built in. As a student logs into his or her account, and takes the test, it is instantly graded. So these self-grading tests can serve the purpose of streamlining a teacher’s “to do list.” The grades show up in a “Google.sheet” format (like an “Excel” spreadsheet, by “Microsoft”).

The advantage of all these “apps” is that they cost nothing to set up and use. Without doubt, Google is in the business of making money, so the question might be, what are they doing with all the information they collect? This has been a concern of many in public education in the United States. However it has not stopped Google from steam rolling past “Microsoft” and others in its quest to dominate the educational software business. It is ongoing.

#### 4. Method

Once it was determined that we would explore “Google.classroom” as a way to meet our threefold challenge, we looked around for teachers within our own school site who were familiar with using it. We did not have a very specific plan for implementing this, nor did we have a budget for doing this.

We found that one of our Technology teachers was already using it and had thoroughly integrated it into her curriculum. She was asked to come to a Science Department meeting and conduct a professional development for Science teachers. Teachers were asked to bring their laptops with them. The two site tech aides were also asked to attend, in case teachers had a difficult time logging on, or had connectivity or other problems. The result was almost instant success and enthusiasm.

After the introductory Professional Development, at a subsequent department meeting, various Science teachers presented how they were using “Google.classroom” in their own teaching. Once again all Science teachers were asked to bring their laptop computers to the meeting so they could have a hands-on experience. Ideas were exchanged, demonstrated for all to see by various individuals.

Later on, a “teacher on special assignment” (TOSA) specifically assigned to help train others, but located at the district office was asked to come in and lead more trainings on how to use various other “apps” in the context of “Google.classroom.” These were conducted as voluntary afterschool events, although there were funds for teachers to be paid for attending. Usually only 25-35% of our teachers showed up for these, but they often generated sharing of the content amongst other members of the department. Other “apps” for which teachers received training were “Padlet.com,” “Kahoot.it,” and “Screencast-o-matic.com.” These non-Google “apps” can be used alongside the “Google.classroom” suite. This individual was invited to conduct other additional trainings and was also available to come in to individual teachers classrooms to work with them. For instance he was available to help individuals set up assignments and then demo them with a teacher’s first period class, then be on site to help them with the classes for rest of their periods of a school day. So teacher training and support was deemed to be essential in moving them forwards with adopting this software and technology.

## 5. Results

The result of the first Science Department teacher training was instant enthusiasm for implementation of “Google.classroom.” Because it was free, and relatively easy to use it sparked immediate interest among almost all present. As those who had already used it shared the ways in which they were using it, teachers saw the potential for its immediate creative application in their own classrooms. Although the first training began in a department meeting, the sharing became informal. Teachers in the lunchroom or in the copy room would share ideas. Soon one idea led to more detailed applications of that idea and it spawned more. So teacher engagement and enthusiasm was high from the beginning.

One of the things which was most appealing was the way in which it had the ability to streamline the grading and paper-handling process. This was because “Google.classroom” use mostly eliminated paper homework. Since assignments can be done and submitted digitally, they could be graded digitally as well. More important, “Google.classroom” can reveal when the assignment was worked on, for how long and when it was submitted. So common excuses about undone homework became impossible to shelter behind, because of the increase in accountability. Teachers were very pleased about this aspect of “Google.classroom.” It dramatically streamlined the processing of Science paperwork processing, which was one of our goals.

One of the other tech tools introduced was “Screencast-o-matic.com.” This software, also free (for up to fifteen minutes of recording time each use, after that one must subscribe), allows teachers to record a presentation on the screen of their computer. For instance, let’s say you have a “PowerPoint” or “Google.slides” presentation. One can record the sound of one’s own voice, and the movements of the cursor, and whatever is on the screen at the time without having one’s image in the picture in any way. Then this “Screencast” can be posted to “Google.classroom”, as an assignment for the students to watch at home. Thus we finally managed to “flip” our classrooms. Not all Science teachers are doing this yet, but perhaps half of teachers have tried this and like doing it.

Then another interesting thing happened. Students brought their own experiences and ideas to the picture. As assignments were posted asking for a “Google.doc” (akin to “Microsoft Word”) perhaps, students would submit the “doc” with a video embedded in it, or decorated with an image in the background. Although these things were not required or for that matter even desired by the teacher for that particular assignment, it became a matter of pride for the students to see who could “jazz theirs up” more than other students. Aspects of students’ own creativity found a measure of expression that was not possible in a two - dimensional paper assignment mode. This increased not only student engagement but also excitement. Many teachers experienced students telling them how to do things, like embed a video in a document. So the students became the teachers, to some degree. They were very excited about this.

Then teachers began to assign students the task of going online and looking for video or animated content. For instance the author broke up the topic of Phase Change and States of Matter into discrete subjects, such as boiling, evaporation, condensation, etc. and assigned them to pairs of students. Their task was to go online and find free videos or animations that depicted their assigned topic the best. They had to evaluate the search results and present the “best” video/animation to the entire class, taking responsibility for explaining its content to the entire class. Other teachers who heard of this adopted it with changes (or not) into their own curriculum and not just in Science.

Having had a very positive experience with that animated content, the author decided to invite students to make their own animated content using “Google.slides.” For the first animation, students were asked to select two or three simple objects such as a square a circle and a triangle and place them into the first slide. Then, they were asked to duplicate the slide, making small changes to the position of each object. As they continued to duplicate each subsequent slide, making more small changes soon they found that if played in rapid succession they had a little movie. The students very enthusiastically embarked on their new role as animators. Then they were assigned through “Google.classroom” the task of demonstrating the balancing of simple chemical reactions using animation. Students put a great deal of creativity into this mini-project. Soon the concept of using “Google.slides” as a stop action animation tool spread throughout the Science department. Such a technique was also applicable to other subject areas in which sequential events occur. Some teachers in Social Studies picked up animation as tool for student expression about chronological events in history for instance.

As the department added more trainings, and brought in more tech tools we began to see some interesting changes. Teachers no longer regarded the Science part of their teaching assignment with the “also have to do” attitude, but began to see it as a desirable. Teachers came early to Science Department meetings, rather than late. Discussion at meetings became animated and even excited, eager to share the latest thing they had achieved using “Google.classroom.”

Student engagement went way up as well, at least anecdotally. Teachers reported less behavior problems using this technology. At this point because we are still in a transition to the new NGSS standards, there is no state standardized Science test yet. In California this year, the first pilot test was rolled out in Spring 2017. The test in 2018 will serve as the benchmark test, so there are no meaningful statistical state results to report. However, as the Science Department set out to write a “Pacing Guide” for the new NGSS standards, the level of interest and participation was high, something not often the case.

## 6. Conclusion

Our adventure into use of the “Google.classroom” suite of apps is incomplete, but ongoing. However, based on anecdotal results alone the experience has been a good one. We are recommend “Google.classroom” to all who ask, at this point.

Of the three goals we set out to accomplish, we believe we have made substantial progress, if not completed the latter two. They are “2-Utilize as many online and other resources which would be adaptable and compatible with the NGSS. 3- Elevate the importance of and interest in Science for both teachers and students.”

The first goal, “1- How to embrace and incorporate the new standards in a way in which it was as effective and as easy as possible to implement for both students and teachers so it would not detract from the Math focus” is somewhat complete. By freeing up more time for teachers, through less paper handling and grading, there is more time available for the Math emphasis. The work on adopting the NGSS and incorporating them into our curriculum is ongoing but we have high expectations.

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# INCREASING LABOUR MARKET SUCCESS POTENTIAL OF YOUNG UNIVERSITY GRADUATES THROUGH PROJECT-BASED EDUCATION

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## Abstract

An overwhelming dynamics of change on today's global labor market constitutes a real challenge for companies and employees, and especially for young people who begin their professional careers and have to face difficult questions concerning career planning and design while the expectations of employers are under a continuous flux. The dynamic job market situation is a strong factor triggering substantial changes in an approach to quality education and in higher education curricula. Presenting the background situation of today's job market and current trends in career counselling, the article discusses a necessity to develop new forms of learning operating on the verge of academic and industry collaboration such as real-life project-based education in order to better prepare young graduates for the demands of the 21c. employment. The article presents quantitative and qualitative research on competencies acquired by students working in real-life projects in international teams versus competencies perceived as desirable by today's global employers. It presents the perceptions of the students who participated in the project-based education in collaboration with companies and confronts them with global employers' expectations.

**Keywords:** *Project-based learning, employability, international teamwork.*

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## 1. Introduction: Contemporary Job Market

Contemporary job market is characterized by high dynamics of change in the scale not experienced before. Globalization processes put the pressure on companies to be more competitive, develop, look for new markets and follow technological advancement at a higher pace than their competitors. The turbulences in the business environment are additionally ignited by the frequent economic and financial crises, increasing the pressure on companies. The pressure is naturally shifted to human capital, often the most important asset in the possession of businesses, the asset which is responsible for an adequate response to the external changes and which creates competitive advantage. Economic sustainability on the market depends, to a high extend, on adaptive abilities of businesses that enable them to restructure and adjust their operations to the requirements of the changing environment but also, as emphasized by Sweet and Meisis, to economize (Sweet and Meisis, 2012). As a result of the above-mentioned considerations, a job market is suffering from uncertainty, lack of job security, constant change (Rousseau, 1996) and these factors seem to have become permanent in a global scale. (Kallenberg, 2009).

## 2. Career development on a contemporary job market

The new situation on the job market calls for a new approach in career planning and construction that would help to prepare young generations for a constant change in their professional and their personal lives. Following the opinions of Savickas (Savickas at al, 2009) models, theories and practices used so far to develop and manage careers might appear inadequate while facing the challenges of globalized economies, in which an individual cannot receive support from an employer as it was before. As a result, career counselling models are in a constant flux and development: protean, kaleidoscopic, and boundaryless or portfolio concepts constitute attempts to define the form that a career might take today to face the challenges of the contemporary global economy. Being unable to rely on one employer, an individual might be involved in numerous projects of verified nature, conducted parallel for different companies. This situation, on the one hand creates opportunities of development, not known before, but on the other hand requires high level of engagement from the side of an individual (Greenhouse, Callanan, 2006) and shifts responsibility for a career development from an employer to an employee. However, the

challenges described above pose new requirements not only to companies but also to universities in their search for such study programs that would provide support for young people and enable them to be successful in their professional lives, not mentioning the fact that this ability is also a salient determinant of competitive advantage and success for the higher education institutions.

According to Forbes magazine (Forbes, 2015) numerous employers complain that today's graduates are not well prepared for work. European Union Strategy 2020 indicates a necessity to increase the ratio of people with university level degrees, which should guarantee higher employability and diminish poverty. Human capital is perceived as a key aspect for economic development of EU, and that is why investment into research, education and innovativeness is inevitable to build a knowledge-based society which, in turn, is impossible without innovative education programs. (European Commission, 2011)

The research conducted at the Maastricht University within the framework of the EU Strategy for the Modernization of Higher Education, conducted in the group of 900 employers in ten European countries, tries to define skills and competencies perceived today as important for a job success:

- ✓ Professional expertise constitutes a basis of employability. Study programs, however, are expected to increase and enhance forms that would enable young graduates to understand real-life problems and help them not to avoid isolation from the environment they will have to work in.

- ✓ Interpersonal skills such as ability to communicate with different audiences are perceived as equally important to expert qualifications since the lack of interpersonal competencies may have a potentially adverse impact on the mission of an organization.

- ✓ Job experience, which in certain cases might be treated as a source of knowledge or help young people to acquire new knowledge.

- ✓ Creativity and innovation in the way of thinking is especially important in specific sectors such as R&D

- ✓ Strategic and organizational competencies are treated as salient for career sustainability

- ✓ Intercultural competencies might be decisive when choosing between candidates representing comparatively equal expertise. Their importance is evident in a global market.

The research conducted by the National Association of Colleges and Employers in the group of 260 employers in Pennsylvania in 2015 showed the companies were most interested in the graduates of engineering, business and computer or IT studies. They also identified the following abilities as crucial for a successful career:

- ✓ Ability to solve problems and make decisions

- ✓ Teamwork skills

- ✓ Professionalism and ethics

- ✓ Proficiency in spoken and written communication

- ✓ Ability to use modern technologies

- ✓ Leadership competencies

It is worth mentioning that the employers today emphasize the importance of transversal skills that were perceived in the past as being of secondary importance. They are not expected to substitute expert knowledge but expert knowledge cannot be used effectively to the advantage of companies without the transversal skills in place.

### 3. Capstone project-based education

Capstone projects realized at Clark University in collaboration with companies in Lodz and Warsaw seem to be an interesting initiative attempting to address the challenges of contemporary job markets. According to American Heritage Dictionary of the English Language the word *capstone* is understood as a “crowning achievement or final stroke, the culmination or acme”. It is, in fact a culmination point in education since it constitutes a complex experience which creates an opportunity to use the knowledge and competencies acquired during studies as well as to learn how to act in a real-life situation, work with a company, collaborate in an international team to generate a business solution that the company has to approve. An international team of 5 or 6 students is responsible for a project, problem verification presented by the company, research conducted within the restraints of a real business situation, effective project and team management, a solution generation and its justification in front of academics and company representatives.

The student teams work on their projects throughout a year, they meet several times with peer teams, all of them working in collaboration with companies. Classes at the university are used as a forum to present progress and share work with other teams in order to receive feedback, consult and develop the project further. Capstone instructors facilitate the process leaving freedom to a team in choosing the best approach and negotiate it with the company. The final solution is presented in a 20 minute presentation in

front of the panel that consists of academics from Poland and USA and company representatives. The students submit a written manuscript report that describes the project in detail, and it is reviewed by an independent academic teacher. The best projects are presented at the International Management Congress held in Warsaw, which gives the students an opportunity to promote their work on a broader forum.

### 3.1. Students' perceptions of Capstone projects in the context of a job market

The survey was conducted in the years 2015, 2016 and 2017 on the group of 80 students from Warsaw and Lodz who completed the Capstone project. The age group ranged from 21 to 40, majority of the students had had job experience of a different kind and length (0, 3 - 10 years).

The aim of the survey was to receive feedback from the students on their perceptions of the usefulness of Capstone for their professional career. Majority of the students, namely 90% claimed that working on a Capstone project helped them acquire new knowledge, 70 % confirmed that Capstone helped them develop skills important at work such as ability to work in a team, communicate effectively with different audiences, manage projects, analyze and synthesize. Numerous students find it helpful in developing problem-solving skills and decision-making skills. The table below presents the students' perceptions in certain categories:

*Table 1. Skills developed in Capstone (own source).*

| <b>What skills did you develop while working in Capstone?</b> | <b>%</b> |
|---|----------|
| Teamwork  | 80       |
| Problem-solving   | 70       |
| Interpersonal communication                                   | 60       |
| Working under pressure  | 60       |
| Project management  | 60       |
| Intercultural communication                                   | 55       |
| Analyze and synthesize  | 40       |
| Leadership  | 30       |
| Collaboration with a company                                  | 27       |

Capstone projects are demanding due to a necessity to collaborate in an international team since the students have to overcome cross-cultural communication problems in action. Group diversity, which is one of the criteria to build a team, poses real difficulties and may have a strong impact on the process of project execution. The students emphasize that effective teamwork is one of the biggest difficulties of the Capstone project due to high diversity of the team. Other challenges indicated by students are connected with working under pressure of time, motivating free riders, planning and organizing work.

Asked about teamwork skills developed during Capstone, the students indicated an ability of collaboration, communication, especially communication across cultures, division of work and responsibilities but also ability to motivate others. The students also stressed the importance of knowing how to share opinions openly, listen to others and respect different points of view, convince others to their ideas, negotiate and precisely communicate ideas, especially in a culturally diversified context.

Collaboration with companies and their presence at the final presentation session are used as an occasion to get feedback from business representatives on the applicability of Capstone projects. Although the opinions about students, their motivation and talents or the quality of the recommended solutions may vary from year to year and team to team, the companies express positive views about the experience as a whole, and are interested in a long-term collaboration. Many of them appreciate a novel perspective that the students take in their recommendations, many implement the student solutions partially, some as a whole.

Collaboration with companies creates an opportunity for students to check if they have expert knowledge and adequate skills that will enable them to work in a real-life context, solve problems, deal with difficulties and be successful. Project-based education schemes realized in a close relation to the business world prove beneficial since they involve all important actors of an educational process and allow them to communicate, share points of view and mutually adapt their expectations to realistic solutions. It is an opportunity for a university to verify the applicability of its study programs, bring them closer to business and economic reality and make decisions on how to fill a potential gap between challenges of the job market and academic program in the offer.

#### 4. Conclusion

Based on the experience resulting from Capstone projects, supported by students' opinions and opinions expressed by the representatives of companies, it has to be confirmed that project-based learning, especially in a real business context should be incorporated into study programs since it helps to link education with real-life problems and expose the students to the business reality as it is, with its restrictions and demands. Project-based learning lets students confront the knowledge and skills they possess with the reality of the work environment and evaluate their education level and its adequacy. This type of learning stimulates students in a positive way in their knowledge quest; they discover knowledge gaps and a necessity to complete them in order to be able to solve complex problems. What is more, they develop an ability to learn, which is one of the most important skills for a sustainable career construction in the quickly changing business environment.

Due to the change of context from purely academic to business-like as well as thanks to a flipped education process, more practical, independent and demanding, the students develop the competencies that are perceived by employers as important success factors: ability to work in an international team, solve complex problems, communicate with others, present their outcomes of work, to work under pressure, analyze and synthesize. It is also worth emphasizing how important project-based learning is for students to become more confident about their individual strengths, necessary for a successful career. Capstone projects create an interesting, dynamic, highly interactive form of practical education and definitely enrich study programs provoking engagement in work and learning but also create a real sense of success and empowerment.

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## EDUCATIONAL FUNCTIONS OF MUSEUMS AND MUSIC IN MUSEUM

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### Abstract

Common components of museums can be listed as, setting up a connection with the past, now and the future through objects; collecting and protecting; exhibiting similarities and differences; creating admiration and pleasure; comprehending educational and cultural transfer.

The history of museology and its perception is made up of the stated components. Even though a lot of advancement was not achieved in the diversification of the museums, especially with Archaeology and Ethnography museums, a huge amount of cultural background and knowledge was brought to light. Their classification, exhibition and making them gain function in accordance with the educational sciences has advanced considerably in the recent years though. Using the opportunities of the technology instead of limited “presentation”, and instead of “visiting” participative museum visiting started to be common.

Compared to the developed countries thematic museology become common in our country in spite of a delay. One of the examples of this is “Music Museums”. It is possible to see the exhibition of the instruments in some of these rare museums and it is also possible to see the object collections related to the music being exhibited in some others. Repertoire, equipage and exhibition facilities of these museums are the reason of their existence, enlightening music history, music science, music education and music taste.

Museums’ educational function become crucial when the cultural and educational background is brought out of the museum and transferred into the life. When it is considered that the knowledge cannot be enough itself but it will be with the processing of the knowledge through education, educational functions takes its place in the priorities of the museums.

This study will focus on the educational functions of the museums. As an example, the musical experience in the energy museum will be explained.

**Keywords:** *Museum, Education, Music.*

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# USE OF MIXED REALITY IN DESIGN STUDIO TO ENHANCE CREATIVITY OF DESIGN STUDENTS

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## Abstract

Design activity requires many alternative design solutions for ill-defined design problems. Thus, designers have to interact with each other in a creative process to generate alternative design solutions. Interacting with each other to solve design problems requires collaborative activities. In design education, both creative and collaborative nature of design process should be supported at the same time. Computer Aided Design (CAD) systems are used to drafting and presentation of preliminary drawings and 3D modeling software enables designers to create realistic 3D models of their designs. However, in architectural design studio courses, design students built their 3D models from clay, card or polystyrene blocks, sketches and initial drawings are produced with pen and paper technique. There is a gap between real objects and computer generated models in design studio education. Design students need to convert design sketches into a single CAD model to modify, transform and print their final design solution. The recent developments and availability of low cost see-through display technologies make possible mixing real objects with virtual information. The use of mixed reality in design education could prove a key component in collaborative learning environments. When used in a collaborative manner, mixed reality could able to achieve a greater level of direct engagement with design studio process. The objective of this study is to develop a conceptual framework for design education environments to support design creativity in a collaborative setting.

**Keywords:** *Design education, Collaborative design, Mixed reality, Creativity support.*

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## 1. Introduction

Considering design as an interactive process, design student frequently interacts with design studio participants in pursuing a satisfactory design solution. This interaction is increased and diversified in which each design student consults with the instructor(s) and the other design students throughout the collaborative process. Besides the efforts of the instructor(s), collaborating with fellow students and developing a project together contribute positively to the design process. This process is an open-ended one while it maintains a focus on the overall goal. Since design problems are ill-defined, at the beginning of the problem, designers have incomplete materials and mental representations. Design students need to exchange their knowledge and information with other design students and different skills of design students have to be coordinated in an environment that supports new ideas are generated and new solutions can be found. To create alternative design solutions, design process requires creativity and collaboration together.

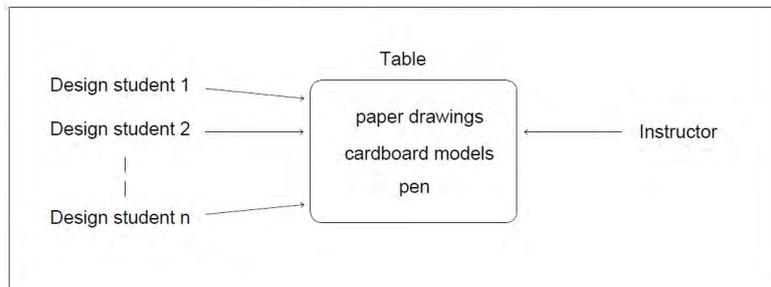
In traditional architectural design education, sketches and initial drawings are produced with pen and paper technique. This gives design students freedom and quick expression in their minds. On the other hand, Computer Aided Design (CAD) systems are used to drafting and presentation of preliminary drawings. Design students need to convert paper based design sketches into a CAD model to modify and transform their final design solution. Considering design education, use of image processing, three dimensional modeling, simulation, multimedia tools and computer networking provide many advantages to the design instructors and students. Rapid and simple accesses to information, easy data formulation and effective communication in information exchange are examples of these possibilities. Internet facilities and usable CAD software have the potential to change design studio process. Although today's design education is mostly depended on face-to-face communication, human-computer interaction and computer mediated human to human interaction also play an important role in guiding cognitive processes.

Traditional CAD systems use graphical user interfaces that rely on point and click mechanisms. 3D models are typically created and modified using keyboard and mouse input. While the “Windows, Icon, Mouse and Pointer” (WIMP) paradigm still prevails, this type of input is only little intuitive and hard to learn, especially when it comes to the conceptual design stage (Company et. al., 2009). In order to facilitate 3D modeling at this stage of design, designers would greatly benefit from an easy and intuitive to use 3D modeling interface that makes spatial manipulation and perception of 3D shapes easier (Wang et. al., 2013). Intuitive and flexible interaction techniques will enable designers to model more effectively, and possibly design better, when using CAD during conceptual design. An emerging and promising interaction metaphor is gesture-based interaction (Huang & Rai, 2014, Arroyave-Tobón et.al., 2015).

**2. Context and Previous Work**

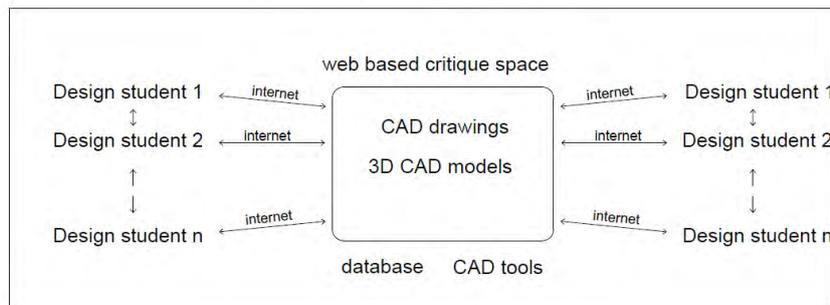
Traditionally, design education mainly based on project-based design studio courses. In traditional design studios, design students get face-to-face critiques either individually or as a group (Figure 1). In studio environment, design students express themselves in drawings, generate and evaluate alternative design solutions, and ultimately make decisions all through the design process (Gross & Do, 1997). This studio setting is completely in real world, design students can share their ideas with other students and instructors via face-to-face communication. Only printed CAD drawings and cardboard 3D models are used to express design student’s alternative design solutions.

*Figure 1. Traditional design studio environment.*



Architectural design process are influenced by the 3D modeling software and allied technological solutions which often require parallel improvements in the design field (Goulding et al., 2014). There has been extensive and growing body of literature on web-based collaborative design studios in the last decade (Simoff & Maher, 2000; Chiu, 2002, Elger & Russell, 2001). The web-based collaborative design studios provide some advantages compared to traditional design studios such as design students do not need to attend a physical studio, but can join a project from anywhere using their web browsers and web-based applications provide various computer applications and medium types as plug-ins or in helper formats, in which the students can create more visual and complex presentations. On-line archiving of design information and keeping track of past experiences provide accessibility opportunities for the other web-based design studios. Today, design students can get their studio critiques on a website using CAD software via the Internet; they can develop their projects collaboratively (Figure 2). In this virtual environment, there are no real objects to generate design solutions.

*Figure 2. Web-based design studio environment.*



Creativity and creative process have many dimensions and involve various social factors that influence creativity, as cultural milieu, collaboration, and rivalry (Simonton, 2003; Hasırcı & Demirkan, 2007). Csikszentmihalyi (1996) explains the social characteristic of creativity as it “does not happen inside people’s heads, but in the interaction between a person’s thoughts and a socio-cultural context. It is systemic rather than an individual phenomenon” (p. 23). and developed a theoretical model, in which he explains the creative process as an interaction between individuals, knowledge domains, and fields or social groups Creativity definitions can be grouped into three categories as focusing; on the creative product, on the individual characteristics of a creative person who is able to produce new ideas or products, and on the creative process (Albert & Runco, 1999; Perry-Smith, 2006). In this study, creativity will be analyzed in terms of creative process. In the literature, there are various approaches to creativity theories in terms of occurrence of creativity. Some scientists claim that creativity is an individual phenomenon, on the contrary, others argue that physical, social and interaction contexts are important for creative process. Although today’s design education is mostly depended on face-to-face communication, human-computer interaction and computer mediated human to human interaction also play an important role in guiding cognitive processes.

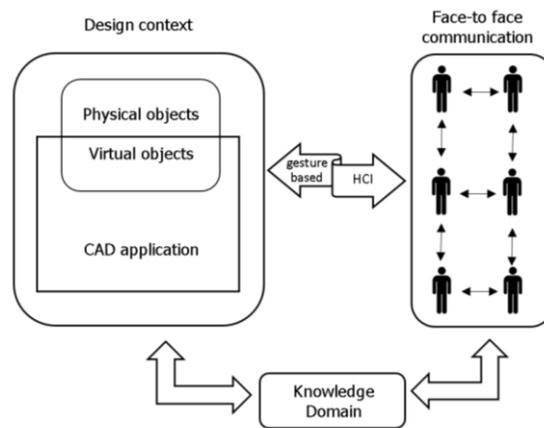
Virtual Reality (VR) systems provide the effect of immersion in the interactive 3D computer-generated environment, transforms design studio into a Virtual Learning Environment (VLE), in which paper based sketches and 3D cardboard models are no longer exist. Design students only interact with digital information and lost face-to-face communication with design studio participants. In Augmented reality (AR) systems, the coexistence of virtual objects and real environments allows learners to visualize complex spatial relationships. However, in design studio environment, AR systems can add a virtual information layer onto real object settings. Design student could see 3D CAD model onto paper based drawing, however, there is no interaction with real and virtual objects. Mixed Reality as a popular technique in Human-Computer Interaction (HCI), which deals with the interaction between the user and the computer. Mixed reality systems combining virtual and real world elements, would have an impact on the areas of architectural practice and education (Young, Sharlin, & Igarashi, 2011). Mixed reality applications promise to use both real and virtual objects together in the design studio environment. Design students both benefit from interaction of physical objects and virtual objects, easily add 3D model, color, texture etc. into real objects to create new alternative solutions to design problem.

### 3. Mixed Reality in Design Studio

Mixed Reality, merges real and virtual environments to produce new environments where physical and digital objects co-exist and interact in real time. The design studio should reach a balance between design students’ abilities and problem solving activities. Intuitive and flexible interaction techniques will enable designers to model more effectively, and possibly design better, when using CAD during conceptual design. When mixed reality applications are used in design studio environment, can help design students communicate with peers about CAD models in a more natural, intuitive, creative and effective way. Designers would greatly benefit from an easy and intuitive to use 3D modeling interaction that makes spatial manipulation and perception of 3D geometry and transformations easier. Research on creativity highlights the importance of social interactions, mentoring, and collaboration in creative work (Amabile, 1983; Csikszentmihalyi, 1996; Candy and Edmonds, 2002; Klemmer et al., 2002).

The proposed framework consists of design context, design students and a knowledge domain respectively (Figure 3). Design context is created by both real objects and virtual information. Physical objects such as paper based drawings and 3D cardboard models and digital objects such as computer generated drawings and 3D models co-exist and interact in real time. Design students can see other design students and instructors via see-through head mounted display, which also provides virtual information. In this studio setting, face-to-face communication maintains more natural communication patterns. Design students can interact with both physical and virtual object by using hand gestures. People often and easily manipulate objects in daily life with their hands, hence, they have a natural desire to use this ability when interacting with computers. Gesture based Human Computer Interaction (HCI) will give design students flexibility and effectiveness during design process, leading to improvements in the alternative design solutions. Knowledge domain stores design problems and solutions; CAD drawings and text based critiques. When the design students retrieve previous comments or critiques, the knowledge domain acts like ‘catalyst’ in generating new ideas as well as in developing them.

Figure 3. Mixed reality design studio environment.



#### 4. Discussion and Conclusion

To support design creativity, the importance and benefit of computational design environment, virtual data in drawing and 3D model formats, should be used with physical objects in design studio environment. Design studio courses also require communication/interaction between students and instructor. Design frequently alternates between divergent stages, where multiple different options are explored, and convergent stages, where ideas are selected and refined (Cross, N. 2007). Design students need to exchange their knowledge and information with other design students and different skills of design students have to be coordinated in an environment that supports new ideas are generated and new solutions can be found.

This study proposes a new approach to design education based on collaborative working to enhance creativity of design students by using mixed reality tools in design education. This study describes a framework for the mixed reality for design education process underlying creativity support; their effects on learning and cognitive process. The use of mixed reality in design education could prove a key component in collaborative learning environments. When used in collaborative manner, mixed reality could able to achieve a greater level of direct engagement with design studio process, in this manner improving academic outcomes. Most CAD systems are developed based on the assumption that creativity is an individual cognitive ability. However, design studio environment could benefit from Mixed Reality's ability to melt the boundaries between reality and virtuality, and creates new way of interactions to support social creativity.

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## DEVELOPING A GRADUATE EMPLOYABILITY PROFILE: HOW DO WE ENSURE WE DELIVER WHAT WE PROMISE?

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### Abstract

This paper describes the rationale, approach and outcomes of the use of Graduate Attributes in Higher Education and a set of badges mapped to each one of them. We decorate syllabi with these badges with the aim of facilitating a programme level view of how any programme of study contributes to the employability profile of our graduates. We suggest that such an approach contributes to quality assurance of programmes in Higher Education as it can guide institutions in their decision making as to how, and how effectively, they build their graduates' profile and ultimately deliver what they promise.

**Keywords:** *Graduate Attributes, Employability, Branding, Badges, Quality Assurance in HE.*

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### 1. Introduction

In times of employment crisis, a university's graduate profile becomes a prominent criterion for employability as there is a need for well-qualified graduates that are able to meet the challenges of the current global labour market demands. Enterprises employ graduates well-educated in their disciplines but also possessing a wide range of skills that are crucial for complex and dynamic environments. Graduate Attributes refer to generic qualities, skills, and abilities that a degree holder should possess but go beyond disciplinary content knowledge (Barrie, 2004). It is expected that such attributes prepare graduates as agents of social good in an unknown future (Bowden, Hart, King, Trigwell, & Watts, 2000), and they form a personal as well as dynamic employability profile.

Although Higher Education (HE) claims to equip students with a number of attributes, only few universities worldwide have articulated their graduate profile, the University of Sheffield (TUOS) being one of them. Even fewer universities have explicitly stated the means by which they achieve to deliver a graduate possessing these attributes. In most cases, graduates hold a degree and a transcript solely indicating their performance in modules (courses) of a programme. However, as TUOS's current strategic plan<sup>1</sup> mentions: *"We want to ensure we equip our students effectively for their chosen path, recognising that employability is an important dimension to our education [...]. Our focus on graduate attributes has led to an expansion in skills development for enterprise, entrepreneurship and employability, including developments both within and outside the curriculum"*. Our Faculty becomes more explicit and defines as a goal in its strategy<sup>2</sup> to *"place the Sheffield Graduate Attributes (SGAs) at the forefront of our efforts to develop a modern employability profile. Justify and promote that we offer what we promise"*.

The aim of this paper is to demonstrate a systematic approach towards acquiring a programme level view over graduate attributes, thus monitoring the way in which modules and other, extra-curricular activities contribute to the graduate profile.

### 2. Developing a set of Graduate Attributes

Defining a graduate employability profile can be thought of as answering the two following questions: (a) What does the market identify as a contemporary graduate profile? and (b) What does the University believe about its graduate profile?

Developing a set of attributes that includes the qualities and skills that a university intends to instill to its graduates is by no means a straightforward process. It typically involves a comprehensive

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<sup>1</sup><http://www.sheffield.ac.uk/als/strategy>

<sup>2</sup>The University of Sheffield International Faculty, CITY College, "Strategy 2016-2021: Values, Quality, Capacity".

survey of employers, who are in a position to identify gaps in the employability skills (Mason, Williams, & Cranmer, 2009), and the review of outcomes and conclusions arising from advisory boards in which professionals and employers are represented. An additional challenge lies in deriving a set of attributes that accurately describe any graduate, irrespectively of the discipline studied.

The intention of our university was to provide departments with a reference point to guide curriculum development, and support for student academic and personal development. The approach was influenced by the literature on developing and enhancing student skills acquisition, which has long advocated the importance of embedding these in the disciplinary context to ensure relevance, engagement and depth, whilst also recognising that this has implications for student awareness and reflection. In addition, employer engagement had identified that graduates were not always well equipped to explain what they had achieved within their studies. As such, TUOS in 2005 derived the following set of SGAs, according to which a TUOS graduate is:

- knowledgeable in their subject area;
- a skilled and ethical researcher;
- information literate;
- a critical, analytical and creative thinker;
- an entrepreneurial problem solver;
- a flexible team worker;
- an accomplished communicator;
- skilled in the use of IT;
- a well-rounded individual, reflective, self-aware and self-motivated;
- an independent learner;
- an efficient planner and time manager;
- someone who sees the big picture, understands the importance of context and is experienced in working with clients, communities and partners outside the university;
- an active citizen who respects diversity and has the cultural agility to work in multinational settings;
- competent in applying their knowledge and skills;
- professional and adaptable.

The above SGAs were then further validated through the industrial advisory boards of all academic departments. Members of the international advisory boards were asked to provide a set of skills that are necessary in the profession, and the resulting set matched well with the SGAs.

Since this paper presents our experience so far with building and communicating TUOS's graduates' employability profile with the SGAs, it refers to the original SGA set that was developed in 2005. It should, however, be noted that the SGA set has been revised in February 2017.<sup>3</sup>

### 3. A Badge for each Graduate Attribute

The University of Sheffield International Faculty, CITY College is one of the six Faculties within the University and the only one operating overseas, in Thessaloniki, Greece. It consists of four academic departments —the Business Administration & Economics Department, the Psychology Department, the Computer Science Department, and the English Studies Department— and offers a wide range of undergraduate and postgraduate programmes.

In 2012, a few years after the identification of the SGAs, the International Faculty (IF), through its Quality Strategy and Enhancement Committee, decided to pilot the use of badges in all modules of all undergraduate and postgraduate. The idea was to design a badge as a form of visual identity for each of the SGAs and decorate with them the syllabi of all modules in an attempt to make clear how the combination of the latter incrementally builds the indented graduate profile. The aim of such an exercise is twofold. The primary goal was to support students to:

- become more familiar with the SGAs;
  - understand how the teaching, learning and assessment methods of each module develop their knowledge and skills; and
  - benchmark (self-assess and self-reflect) their progress with respect to the SGAs.
- On the other hand, it aimed to serve as a tool for guiding academic staff towards:
- considering the SGAs as a driver for their learning, teaching and assessment strategy as well as for the aims and learning outcomes of programmes and modules;
  - justifying their teaching, learning and assessment methods towards the graduate profile they wish to develop; and

<sup>3</sup><https://www.sheffield.ac.uk/sheffieldgraduate/studentattributes>

- supporting students to develop their employability profile.

Various discussions took place regarding what such badges might actually look like. The option of digital badges was researched and considered. A digital badge is a visual representation, an image, of an achievement or an acquired skill. It includes metadata that contain, in addition to the description of the skill, links to the process involved and to the requirements for obtaining it, as well as evidence of learning activities that contributed in meeting the requirements and in earning the badge. An important feature of the digital badges is that they can be displayed on web sites, on social networks sites, on electronic CVs and portfolios, thus providing the opportunity to the learner to demonstrate, in addition to the formal qualifications, their skills and accomplishments to any interested party, such as potential employers. The practice of creating, awarding and displaying digital badges is related to the concept of Gamification and therefore digital badges are considered as a tool for motivating learners to be engaged in positive learning experiences and to easily determine their progress in learning (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015).

Although the option of digital badges seemed very promising, at that point in time the concept of digital badges in formal education was still an emerging one without any significant research especially in the area of higher education. Consequently, it was thought that this concept should be reconsidered in the future and that an alternative route should be followed.

As a result of the discussions, it was decided that each badge would have a crest-like shape of a different colour with the corresponding SGA written in the upper part and would also be uniquely identifiable by the SGA’s initials<sup>4</sup> (Figure 1). An additional three badges (namely “*Explore in Greater Depth*”, “*Critically Analyse the Knowledge, Ideas and Research*”, and “*Independent Responsibility for Learning*”), which are not further discussed in this paper, have been designed particularly for use in postgraduate modules.

Figure 1. The Badges, which correspond to the Sheffield Graduate Attributes.

|                                  |                                |                               |   |                      |                          |   |  |
|----------------------------------|--------------------------------|-------------------------------|---|----------------------|--------------------------|---|--|
| Subject knowledge                | Independent learner            | Skilled & Ethical Researcher  | Critical, Analytical & Creative thinker | Information literate | Skilled in the use of IT | accomplished communicator                 | Flexible Team Worker                         |
| <b>K</b>                         | <b>L</b>                       | <b>R</b>                      | <b>CAC</b>                              | <b>I</b>             | <b>IT</b>                | <b>AC</b>                                 | <b>TW</b>                                    |
| Efficient Planner & Time Manager | Entrepreneurial Problem Solver | Applying Skills and Knowledge | Active Citizen who respects Diversity   | Culturally Agile     | Professional & Adaptable | Well rounded, Reflective & Self motivated | Working with clients, communities & partners |
| <b>PTM</b>                       | <b>EPS</b>                     | <b>ASK</b>                    | <b>ACD</b>                              | <b>CA</b>            | <b>PA</b>                | <b>RSM</b>                                | <b>CCP</b>                                   |

The existing syllabus template was updated accordingly to include one more section listing the badges of the SGAs that every module contributes to. All academic departments were encouraged to start using the badges to also decorate all promotional posters of forthcoming extra-curricular activities and events, such as seminars, workshops, company visits, etc.

At the end of the first semester that the badges were used, an evaluation of the pilot application took place through the examination of all the decorated syllabi. Although the results had been overall satisfactory, the evaluation brought forward some interesting cases as there were modules:

- with none, one or two badges,
- with twelve up to all badges,
- with no “knowledge” badge, etc.,

and this led to discussions with the involved academic staff in an attempt to identify the reasons behind such extremes. As expected, some of these cases were honest mistakes; however the evaluation also made clear that there were misunderstandings on what specific modules intended to achieve. For example, there were colleagues that used the badge “*Skilled in the Use of IT*” just because students needed to submit a typewritten report and others that use “*Flexible Team Worker*” just because they had an in-class exercise in groups. On the contrary, there were colleagues that did not use “*Cultural Agility*” although the coursework involved weeks-long groupwork carried out from students of different nationalities and cultures.

As a result we identified that there was a need for academic staff development with regard to what the SGAs stand for and the appropriate use of the badges. Other corrective steps included providing

<sup>4</sup>The badges are currently being redesigned both for reasons of aesthetics as well as in order to match the revised Sheffield Graduate Attributes.

updated guidelines, such as a quota in the number of badges used in each syllabus, restricted to a maximum of eight.

The same conclusion was reached after the evaluation of the promotional material, which is primarily produced not by academic but by the Career's Office and the Communication, Marketing and Student Recruitment department, and was therefore considered that training of administration staff of these departments was also necessary.

As a last step of the evaluation process at that stage, we run a small survey to assess the extent to which students were familiar with module badging. It turned out that the number of students who could explain the rationale was less than expected. To increase student awareness, we:

- asked all staff to explicitly go through the badges listed on each module during the first class of the semester when the syllabus was presented and explained;
- internally promoted the SGAs with a poster entitled “*Your Employability Profile*” that listed all attributes together with their corresponding badges. The poster was then on display at various places within the premises for the students to see and make the implicit connection;
- referred to the SGAs in the last year self-reflection exercise, in which the students are encouraged to reflect on what they have learned and achieved throughout their studies; and
- encouraged students to use them in developing their CVs.

Monitoring the correct use of the badges on syllabi is an ongoing process that still takes place at regular intervals or when new modules are introduced to a programme.

#### 4. Monitoring the Contribution towards the Employability Profile at Programme Level

After a short while of using the badges to decorate our modules' syllabi, it became apparent that this exercise need not stop at individual modules' monitoring, and that this pilot provided for a great opportunity and the means to identify whether entire programmes of study actually cultivated the promised SGAs.

At the end of the first academic year that the badges were used, all academic departments undertook the exercise of benchmarking the coverage of the SGAs in each one of programmes they offered. This activity involves the complete mapping of all modules of a programme to the respective SGAs that it contributes to, with the aim of identifying gaps, and assessing the balance, or lack thereof, with which all SGAs are covered throughout the programme.

Due to space restrictions, Table 1 presents a snapshot of such a mapping, only for the modules of the 1<sup>st</sup> level of studies of an undergraduate programme, although the exercise involves the mapping of all units of all levels of each programme. Rows represent the eleven offered modules, while columns the sixteen SGAs. The last row and column sum the number of modules that contribute to a given SGA, and the number of SGAs a given module contributes to, respectively.

Table 1. Mapping of SGAs/Badges to the modules of the 1<sup>st</sup> level of studies of an undergraduate programme.

| LEVEL 1 |    |   |   |     |     |    |    |    |     |   |     |     |     |    |     |    |    |
|---------|----|---|---|-----|-----|----|----|----|-----|---|-----|-----|-----|----|-----|----|----|
| Module  | K  | R | I | CAC | EPS | TW | AC | IT | RSM | L | PTM | CCP | ACD | CA | ASK | PA | 16 |
| 1       | √  | √ | √ | √   | √   | √  | √  |    |     | √ | √   | √   | √   | √  | √   | √  | 14 |
| 2       | √  | √ | √ | √   |     | √  |    |    |     |   |     |     | √   |    |     |    | 6  |
| 3       | √  | √ | √ |     |     |    |    | √  | √   | √ | √   |     |     |    | √   | √  | 9  |
| 4       | √  |   | √ | √   |     |    |    | √  |     | √ |     |     |     |    |     |    | 5  |
| 5       | √  | √ | √ |     |     |    | √  | √  |     | √ | √   |     |     |    | √   | √  | 9  |
| 6       | √  |   | √ |     |     |    |    |    |     |   |     |     |     |    | √   |    | 3  |
| 7       |    |   |   | √   |     |    |    |    | √   | √ |     |     | √   | √  |     |    | 5  |
| 8       | √  | √ | √ | √   | √   |    |    |    | √   | √ | √   |     |     |    | √   | √  | 10 |
| 9       | √  | √ | √ | √   | √   |    |    |    | √   | √ | √   |     |     |    | √   | √  | 10 |
| 10      | √  |   |   |     |     |    | √  |    | √   | √ |     | √   | √   | √  | √   |    | 8  |
| 11      | √  |   |   |     |     | √  | √  |    |     |   |     |     | √   | √  | √   | √  | 8  |
|         | 10 | 6 | 7 | 6   | 3   | 3  | 3  | 3  | 5   | 8 | 6   | 2   | 5   | 4  | 8   | 6  |    |

The results of this exercise provided the departments with very useful insight and ample food for thought with regard to the extent that each programme actually cultivates the promised SGAs. This mapping makes it easier to identify whether there are issues with individual units, as discussed in the previous section. Most importantly, however, it allows us to have a clear overview of how many opportunities our students have to develop each of the SGAs. From Table 1, for example, it is clear that “*Subject Knowledge*” (K) is overrepresented, as is expected; it is rare that a module does not contribute new subject knowledge, especially in the 1<sup>st</sup> level of studies. On the contrary, students only have the

opportunity in two modules to “*Work with Clients, Communities and Partners*” (CCP), which may, again, be totally reasonable and expected in their 1<sup>st</sup> level of studies.

As a result, and taking for granted that individual modules are correctly mapped to the SGAs they contribute to, the mapping of units to badges at programme level, offers us two significant advantages. Firstly, we get to see the total number of modules in a programme that develop each SGA, thus helping us identify which ones are underrepresented so we can direct our efforts towards offering a better, more balanced coverage.

Secondly, and possibly more importantly, it offers valuable insight to the level-to-level progression of the SGAs’ coverage. By definition, particular SGAs require a higher level of maturity and should preferably be covered in greater extent at higher levels of study (such as the aforementioned “*Working with Clients, Communities and Partners*”, or “*Critical, Analytical and Creative Thinker*”), whereas others should appear more often in earlier levels to equip students with fundamental skills that are necessary throughout their studies (such as “*Efficient Planner and Time Manager*”).

As an extension of the programme level mapping of all modules, extra-curricular activities are also mapped to the SGAs they contribute to and are taken into consideration when evaluating a programme overall. Also, similar mappings have been created for all our postgraduate programmes as well, including the three additional SGAs. Interpreting the mapping results for postgraduates programmes is a quite more challenging task as some SGAs can be presumed to have been covered as part of our students’ undergraduate studies, however a detailed discussion on this matter falls outside the scope of this paper.

To conclude, we believe that the approach described in this paper highly contributes towards Quality Assurance in Higher Education. Same as any claim in relation to what a university programme offers its students, developing and promoting an employability profile to graduates must be more than a mere promise, but rather a commitment that can be backed up by concrete, even measurable, evidence.

## 5. Conclusions

Based on our university’s Graduate Attributes, we propose a way to monitor, at programme level, how the employability graduate profile is developed by individual modules. We designed a set of badges that decorate all module syllabi as well as all extra-curricular activities. Those are used to cross check whether a programme delivers the profile of the graduate it promises in its specification. The process followed results in interesting observations that help us identify actions that can be taken towards ensuring a good balance of contribution to the graduate attributes among all modules of a programme as well as additional activities designed to enhance the student experience.

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## **TEACHING ENGLISH AS A FOREIGN LANGUAGE BY ADAPTING MATERIALS ACCORDING TO STUDENT'S LEARNING STYLES**

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### **Abstract**

The aim of this research is to be aware of the importance of knowing the different learning styles in order to match the teaching styles with the individual learning preferences. On this study, English as a Foreign Language (EFL) subject was taught by taking into account the VAK learning style (Visual, Auditory and Kinaesthetic learning style). As to adapt the materials to each individual, the Multisensory Instructional Packages, first introduced by Rita Dunn and Kenneth Dunn in 1979, were designed and carried out for this purpose. These packages included materials and resources about specific contents that were designed and chosen by the teacher.

The aims of this study were to determine the learning styles of the second graders from a class of a school located in Barcelona and to evaluate the efficiency of learning specific contents of English as a Foreign Language (EFL) subject by considering the students' learning styles.

A questionnaire, originally from Cohen A.D. and Weaver, S.J. in 2006, was carried out as to know the learning tendencies of each child and, based on these results, few sessions were designed and took place during the English classes on which students used the Multisensory Instructional Packages. A final assessment, designed by the English teacher, was carried out as to evaluate the efficiency of the contents they learnt. It included four language contents: use of English, listening, speaking and reading and writing.

69.2% of the pupils had a tendency towards kinaesthetic learning style, 7.7% had a tendency towards auditory/kinaesthetic learning style and 23.1% had a tendency towards visual/kinaesthetic learning style. Based on the results of the final assessment in Use of English, Listening, Speaking and Reading and Writing, it was clear that the learning efficiency was high thanks to the adjustments of the teaching styles with the learning styles.

To conclude, being aware of the different type of learning styles could benefit both teachers and pupils because for a good improvement and success in school, the teaching style must complement the students' learning styles.

**Keywords:** *English as a Foreign Language, learning styles, VAK, Multisensory Instructional Packages.*

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### **1. Introduction**

English is the international language that is commonly used to communicate with others (Dahmen, 2011). However, not all students master English as a foreign language. For this reason, the intention of this research is to match teaching methods with students' learning styles, by using the Multisensory Instructional Packages (first introduced by Rita Dunn and Kenneth Dunn in 1979), as to prove that apprentices could learn English significantly.

One of the reasons why students do not academically succeed may be the Bedford's hypothesis (2004), which affirms that the mismatching of the students' learning styles and the teachers' teaching styles may be the motive why pupils fail in school. In the investigation by Dyer (2008), for a good improvement and success in school, the teaching styles must complement the students' learning style.

After doing a wide research of the topic, a list of the different learning styles was done as to show the different types of learning styles that have been studied since the subject was first thought until now (2016). The different learning styles are:

Kolb's (1984) experiential learning model:

- Diverger learning style
- Assimilator learning style
- Converger learning styles
- Accommodator learning style

Gregorc's (1979,1997) learning style model:

- Concrete-sequential learning style
- Abstract-sequential learning style
- Abstract-random learning style
- Concrete-random learning style

Dunn and Dunn's (1979) five different learning styles:

- Environmental
- Emotional
- Sociological
- Psychological
- Psychological Processing

Gardner (1993) identifies seven distinct learning intelligences:

- Visual-spatial
- Bodily-kinaesthetic
- Musical
- Interpersonal
- Intrapersonal
- Linguistic
- Logical-mathematical

The Myers-Briggs Type Indicator by Myers and MacCaulley (1985) measures

preferences on four scales derived from Jung's Theory of Psychological Types:

- Introversion
- Extroversion
- Sensing
- Intuition
- Thinking
- Feeling
- Judging

Keirsey (2001) identifies the following temperament types:

- Artisans
- Guardians
- Idealists
- Rationals

McCarthy (1990) identifies four learning styles:

- Innovative learners
- Analytic learners
- Common sense learners
- Dynamic learners

The Grasha (1996) model:

- Avoidant students
- Participative students
- Competitive students
- Collaborative students
- Dependent students
- Independent students

Berman (1998) identifies the VAK learning style:

- Visual learners.
- Auditory learners.
- Kinaesthetic learners.

### 1.1. Visual Learners

- They use the sense of sight (Picket, 1988).
- They prefer to learn by visual materials: maps, charts, graphs, diagrams, highlighters, different colours, pictures, word pictures, etc (Fleming, 2001).
- They learn by seeing the content in writing or images and by watching videos (Kanar, 1995).
- They need to make pictures in their minds (Kanar, 1995).
- They are not able to learn something until they have seen it (Lightbown and Spada, 1999).
- Visual materials can reduce textual explanations because are accompanied by visual supports (Kanar, 1988).

### 1.2. Auditory Learners

- They retain best the information by listening and hearing explanations (Kanar, 1995).
- They usually repeat the statements that the teacher said or read aloud and are the most talkative (Kanar, 1995).
- They learn best through verbal lectures, discussions, talking things through and listening to what others have to say (Gardner, 1985).

### 1.3. Kinaesthetic Learners

- They prefer active participation (Reid, 1987).
- They like field trips, trial and error, doing things to understand them, laboratories, recipes and solutions to problems, hands-on approaches, etc (Fleming, 2001).
- They need to touch and move their bodies (Kanar, 1995).
- They usually have difficulty paying attention and "can't seem to be focused" (Gardner, 1985).

### 1.4. What If a Student Has More than a Preferred Learning Style?

If a student learns equally by more than a learning style, it means that they possess either the multimodal learning (Moreno and Mayer, 2007) or the bimodal learning, in case they learn best by two learning styles (Kharb, 2013).

## 2. Design

26 seven-year-old learners from a classroom of an elementary school were given an adapted questionnaire to test their learning styles: visual, auditory, kinaesthetic, visual/auditory, kinaesthetic/auditory, visual/kinaesthetic and visual/kinaesthetic/auditory.

The original questionnaire can be found on the reference: Cohen, A.D. & Weaver, S.J. (2006). *Styles-and Strategies-Based Instruction: A Teachers' Guide*. Minneapolis, MN: Center for Advanced Research on Language Acquisition, University of Minnesota, pp. 75-78.

After students' learning styles were tested, a specific content of English as a Foreign Language (EFL) subject was taught in a sequence of 7 sessions (1 hour per session) by meeting the pupils' learning styles and needs. The didactic method that was used is the Multisensory Instructional Packages (Dunn and Dunn, 1984). They were designed by the teacher and were based on the ones introduced by Rita Dunn and Kenneth Dunn in 1984).

The content consisted of use of English (verb "to have" and prepositions), listening (phonetics: the sound /i/), speaking (real use of the verb "to have" and adjectives) and reading and writing (new vocabulary about animals, habitats and adjectives).

### 3. Objectives

The purposes of this research are to:

1. Determine the learning styles of the primary students of a classroom in a school located in Barcelona, Spain.
2. Evaluate the efficiency of learning specific contents of English as a Foreign Language (EFL) subject by considering the primary students' learning styles.

### 4. Methods

In order to evaluate the apprentices' learning efficiency of English as a Foreign Language (EFL) subject, an assessment was carried out after the whole 7 sessions. Its intention was to evaluate if pupils learnt the content taught by the packages (use of English, listening, speaking and reading and writing).

The punctuation of each part went from 0 to 10, being zero the lowest grade and 10 the greatest. Use of English, listening and reading and writing parts of the final assessment were completed in written format and the speaking part was completed in an oral format that the teacher evaluated while pupils talked.

A fail was any grade below 5. A good was any grade between 5 and 6.9. A very good was any grade between 7 and 8.9. An excellent was between a 9 and a 10.

This assessment was designed by the teacher and validated by professor Maria González Davies from Universitat Ramon Llull- Facultat de Psicologia, Ciències de l'Educació de l'Esport Blanquerna.

### 5. Discussion

Table 1 shows that none were visual (V), auditory (A), visual/auditory (V/A) or visual/kinaesthetic/auditory (V/K/A) learners, 69.2% were kinaesthetic (K), 7.7% kinaesthetic/auditory (K/A) and 23.1% visual/kinaesthetic (V/K).

*Table 1. Pupil's learning styles.*

| Learning style               | Frequency | Percentage |
|------------------------------|-----------|------------|
| Visual                       | 0         | 0          |
| Auditory                     | 0         | 0          |
| Kinaesthetic                 | 18        | 69.2       |
| Visual/auditory              | 0         | 0          |
| Kinaesthetic/auditory        | 2         | 7.7        |
| Visual/kinaesthetic          | 6         | 23.1       |
| Visual/kinaesthetic/auditory | 0         | 0          |
| <b>Total</b>                 | <b>26</b> | <b>100</b> |

It was found in this study that 30.8% of the students had two learning style preferences. Additionally, all of the pupils were kinaesthetic, either only K or K/A and V/K.

Table 2 shows the grades of the use of English content of V/K learners, K/A learners and K learners. The majority of the classroom group had a very good (36%) and an excellent (40%). The rest had a good (24%). A student did not attend to the use of English part of the final assessment (n=25).

Table 2. Grades of use of English content.

| Grades                | <5 (fail) |          | 5-6.9 (good) |           | 7-8.9 (very good) |           | 9-10 (excellent) |           |
|-----------------------|-----------|----------|--------------|-----------|-------------------|-----------|------------------|-----------|
|                       | F         | %        | F            | %         | F                 | %         | F                | %         |
| Learning styles       |           |          |              |           |                   |           |                  |           |
| Visual/kinaesthetic   | 0         | 0        | 0            | 0         | 2                 | 40        | 3                | 60        |
| Auditory/kinaesthetic | 0         | 0        | 1            | 50        | 0                 | 0         | 1                | 50        |
| Kinaesthetic          | 0         | 0        | 5            | 27.78     | 7                 | 38.89     | 6                | 33.3      |
| <b>Total</b>          | <b>0</b>  | <b>0</b> | <b>6</b>     | <b>24</b> | <b>9</b>          | <b>36</b> | <b>10</b>        | <b>40</b> |

Table 3 shows the grades of listening content. Most of the classroom group had a very good (28%) and an excellent (40%). A student did not attend to the listening part of the final assessment (n=25).

Table 3. Grades of listening content.

| Grades                | <5 (fail) |          | 5-6.9 (good) |           | 7-8.9 (very good) |           | 9-10 (excellent) |           |
|-----------------------|-----------|----------|--------------|-----------|-------------------|-----------|------------------|-----------|
|                       | F         | %        | F            | %         | F                 | %         | F                | %         |
| Learning styles       |           |          |              |           |                   |           |                  |           |
| Visual/kinaesthetic   | 0         | 0        | 3            | 60        | 1                 | 20        | 1                | 20        |
| Auditory/kinaesthetic | 0         | 0        | 0            | 0         | 1                 | 50        | 1                | 50        |
| Kinaesthetic          | 0         | 0        | 5            | 27.78     | 5                 | 27.78     | 8                | 44.44     |
| <b>Total</b>          | <b>0</b>  | <b>0</b> | <b>8</b>     | <b>32</b> | <b>7</b>          | <b>28</b> | <b>10</b>        | <b>40</b> |

It reveals that none of the students failed (0%), the majority of the V/K pupils had a good (60%), 20% of them had a very good and another 20% had an excellent. Half of the K/A students had a very good (50%) and the other half had an excellent (50%). Most of the K learners had an excellent (44.44%), whereas the 27.78% had a very good and another 27.78% had a good.

Table 4 shows the grades of speaking content. The majority of the classroom group had an excellent (65.38%) and the other 34.62% had a very good. All of the students attended to the speaking part of the final assessment (n=26).

Table 4. Grades of speaking content.

| Grades                | <5 (fail) |          | 5-6.9 (good) |          | 7-8.9 (very good) |              | 9-10 (excellent) |              |
|-----------------------|-----------|----------|--------------|----------|-------------------|--------------|------------------|--------------|
|                       | F         | %        | F            | %        | F                 | %            | F                | %            |
| Learning styles       |           |          |              |          |                   |              |                  |              |
| Visual/kinaesthetic   | 0         | 0        | 0            | 0        | 4                 | 66.7         | 2                | 33.3         |
| Auditory/kinaesthetic | 0         | 0        | 0            | 0        | 0                 | 0            | 2                | 100          |
| Kinaesthetic          | 0         | 0        | 0            | 0        | 5                 | 27.8         | 13               | 72.2         |
| <b>Total</b>          | <b>0</b>  | <b>0</b> | <b>0</b>     | <b>0</b> | <b>9</b>          | <b>34.62</b> | <b>17</b>        | <b>65.38</b> |

This table reveals that none of the students failed (0%), the majority of the V/K pupils had a very good (66.7%) and the other 33.33% had an excellent. All of the K/A students had an excellent (100%). Most of the K apprentices had an excellent (72.2%) and the other 27.8% had a very good.

Table 5 shows the grades of reading and writing content. Most of the classroom group had a very good (52%), followed by a 32% who had an excellent, a 16% had a good and a 4% of the students failed. A learner did not attend to the reading and writing part of the final assessment (n=25).

Table 5. Grades of reading and writing content.

| Grades                | <5 (fail) |          | 5-6.9 (good) |           | 7-8.9 (very good) |           | 9-10 (excellent) |           |
|-----------------------|-----------|----------|--------------|-----------|-------------------|-----------|------------------|-----------|
|                       | F         | %        | F            | %         | F                 | %         | F                | %         |
| Learning styles       |           |          |              |           |                   |           |                  |           |
| Visual/kinaesthetic   | 0         | 0        | 0            | 0         | 4                 | 80        | 1                | 20        |
| Auditory/kinaesthetic | 0         | 0        | 1            | 50        | 1                 | 50        | 0                | 0         |
| Kinaesthetic          | 1         | 5.55     | 3            | 16.67     | 7                 | 38.89     | 7                | 38.89     |
| <b>Total</b>          | <b>1</b>  | <b>4</b> | <b>4</b>     | <b>16</b> | <b>13</b>         | <b>52</b> | <b>8</b>         | <b>32</b> |

This table reveals that one student failed (4% of the whole classroom and 5.55% of the K apprentices). The majority of the V/K learners had a very good (80%) and the other 20% had an excellent. Half of the K/A pupils had a good (50%) and the other half had a very good (50%). 38.89% of the K learners had a very good and the same percentage (38.89%) had an excellent. A 16.67% of them had a good and only a 5.55% failed.

According to the students' opinions, they were satisfied with the Multisensory Instructional Packages because they said these packages consisted of learning things in the way they wanted them to be presented.

## 6. Conclusions

Based from the results of this study, the following conclusions were drawn:

- Most of the students were kinaesthetic and a low percentage were visual or auditory.
- The grades from the final assessment were high.
- The use of a questionnaire as to determine pupils' learning styles is easy to take and provides immediate results that makes students aware of their learning styles and helps teachers to use adapted materials and resources.
- Being aware of the different type of learning styles could benefit both teachers and pupils because for a good improvement and success in school, the teaching style must complement the students' learning styles.

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## ENHANCING CREATIVITY AND FOSTERING EDUCATION TO ENABLE COMMUNITY DEVELOPMENT. CASE STUDY IN FAVARA (SICILY – ITALY)

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### Abstract

The research explores the role of creativity and education in Favara, a town in the economically depressed Province of Agrigento. After the *European Year of Creativity and Innovation* the European Commission proposed the strategy Europe 2020 with the aim of “smart, sustainable, inclusive growth”. The purpose of this research is to identify best practices undertaken by these guidelines through creativity. The research is set in Favara, where I was artist-in-residence to conceive a project based on the immaterial inheritances of Sicily, promoted by I-Art Association. I have been hosted by *Farm Cultural Park*, a cultural and creative center founded and granted by two private citizens of Favara with the ambition to foster creativity and develop sense of belonging in a city lacerated by unauthorized architectural development, and in a community oppressed by illegality and unemployment with a GDP among the lowest in Italy. I was not only dealing with inheritance but also with the concept of “dowry”: the aim of Farm is to offer children a better world. The double role of artist and ethnographer helped me to resolve this ostensible oxymoron: being artist-in-residence means to be completely part of the setting and this status enhanced my role as ethnographer. I combined the maieutic approach in perceiving the genius loci as artist with the “connective thinking” (Agar, 2006) in order to reach an anthropological holism. I detected qualitative data with participant observations in Favara and in the microcosm of Farm, finding out relationships through an ecological view (Bateson, 1977/2011). In order not to interfere with the research I produced my artwork when I left the field of investigation. The research came out with the result that Farm is a best practice according to Europe 2020 guidelines because it is able to grow sense of belonging, turn on virtuous economically circle, redesign architecture. Inventing new way of involving participant community, conceiving new methods of learning, fostering intergenerational relationships displays that creativity is the driving force that moves civilization toward (Hennessey & Amabile, cited in Sawyer, 2010). *Farm Cultural Park*’s people have the ability to evoke new perspectives, to go out of the frames (Sclavi, 2003), because they experienced that lifelong learning is the way to reserve experiences and stories (Dozza, 2016). Today with its 54.444 likes on Facebook, *Farm Cultural Park* is a sort of Favara’s amplifier (Bruner, 1976): its inhabitants are virtually almost redouble.

**Keywords:** *Creativity, education, inclusion, intergenerational, lifelong learning.*

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### 1. Introduction: policy and cultural framework

In 2009 the European Parliament and the Council declared 2009 the *European Year of Creativity and Innovation* to face the economical depression and enhance synergy between the member states. “Declaring a European Year of Creativity and Innovation is an effective way of helping to meet the challenges facing Europe by raising public awareness, disseminating information about good practices and promoting research and public debate.” (EC, 2008, sec. 7). Already with the Lisbon objectives in 2006 - “knowledge and innovation are seen as the beating heart of European growth” (Ferrari, Cachia, & Punie, 2009, p. 1) - creativity became the new concept for EU policy-making, as “a driver for innovation and a key factor for development of personal, occupational, entrepreneurial and social competences and well-being of all individual in society” (EC, 2008, art.1, sec. 2). These were the preludes of the European Commission’s Europe 2020 strategy for smart, sustainable and inclusive growth. President Barroso in his preface underlined that the “the crisis is a wake-up call, the moment where we recognize that “business as usual” would consign us to gradual decline, to the second rank of the new global order” (COM 2010, p. 29).

## 2. Objectives: the role of creativity and education in building community development

### 2.1. Preface: general description of the research question

The research takes inspiration by these European guidelines in order to find out best practices undertaken by the civil society through creativity. The purpose is to test the validity of community education contests, involved with creativity, of small towns in Italian economical depressed areas. I came up with the idea to investigate the territory of the Agrigentino<sup>1</sup>, when I was artist-in-residence selected<sup>2</sup> by an international call granted by I-Art in Palermo. I-Art is an association operating in Sicily, whose aim is to promote culture and a new artistic and cultural movement. Thanks to its projects the Association benefits from European Regional Development Fund (EU., Treaty of Lisbon, Art. 178), supported by Europe 2020 strategy.

### 2.2. The choice of Favara (Sicilia) as case study

I spent a month living in Favara, a small town of 32.000 inhabitants. My goal was to conceive an artistic project based on the immaterial inheritances of Sicily. I have been hosted by a cultural and creative center based in the heart of the city: *Farm Cultural Park*. Getting in touch with the people and investigating the territory I realize that Favara's reputation, known especially because of Mafia's slaughter of the 1980s and 90s (Cacciato, 2015), crashing unemployment and neglected civic sense, was rehabilitated by the extraordinary power of creativity and beauty. Referring to the way to reach a new humanism Morin says "the reform should tend to instill a deep sense of aesthetic not as a lux, but as an essential dimension for the realization of the life of each"<sup>3</sup> (Morin, 2012, p. 145). I realized that the town, and the Region itself, was living a rebirth in terms of economical improvement, urbanistic redesign, community development, flowering of new educational processes. I was not only dealing with inheritance but also with the concept of "dowry", so I recognize that I could have the opportunity to set a scientific investigation in order to witness the extraordinary growth of this town. "Carla e Viola have been the driving force. ... We want to give them back the dimension of honesty and of the possibilities"<sup>4</sup> (Cacciato, 2015, p. 124) tells the cofounder of *Farm Cultural Park* Florinda Saieva mentioning her daughters and justifying the choice of the project.

## 3. Methods: an ethnographic approach with an eye on the contest-sensitive science

Being artist-in-residence working with installations in public space, means to handle with care with the *res publica* and feeling the *genius loci* of the setting, finding out the identity of a scenario lived by people breathing and acting. This maieutic approach led me automatically to choose the qualitative method of ethnography that "... asks us to be persistently creative, imaginative, and original. And it demands, most importantly, that we become comfortable with the contingencies and ambiguities of human relationship" (Campbell & Lassiter, 2015, p. 12). I did participant observations pointing out the setting and discovering the visible and invisible architecture of the space. I have been living as the *favarese*<sup>5</sup> does: doing shopping at the local market, attending to the Mass every Sunday, doing slalom among the cars in the small streets of the historical center due to the lacks of footpaths, going to hairdresser every week like the local ladies do, going through the neighborhood's screams, grilling the bbq on the countryside. I also acquired - for me - new habits like hanging up the trash outside the flat's window or driving the Vespa<sup>6</sup> without the helmet. I also lived the vibrant artistic and cultural venue of *Farm Cultural Park* meeting its local community and getting acquaintance with a lot of creative people coming from all around the world. The dichotomy of this two realities generated a "space of possibilities" (Agar, 2006, p. 3) coverable thanks to the ecological view offered by Bateson (2011). According to Spradley (2016) I did ethnographic interviews with social means: "meeting the mankind world, as to say the real world of the real people, with all its richness of multidimensional relationships, conflictual or harmonious, mainly fluid."<sup>7</sup> (Ferrarotti, 2016, p. 25). In order to grasp all the traces of creativity in the conflicting territory of Favara, I felt the need to adhere to Mode 2 approach to knowledge production which proposes a broader range of perspectives. According to Gibbons "the environment is 'speaking back' to science and society is looking for leadership in the production of context-sensitive science"

<sup>1</sup> Agrigentino, the area near the city of Agrigento (Sicily).

<sup>2</sup> <http://www.i-art.it/it/press/comunicato-stampa/7/ARTEeccolalistadei30artistiselezionatedeicomuniassegnati>.

<sup>3</sup> Original text: "La riforma dovrebbe tendere a inculcare un senso profondo dell'estetica non come lusso, ma come una dimensione essenziale per la realizzazione poetica della vita di ciascuno" (pag. 145).

<sup>4</sup> Original text: "Carla e Viola sono state la forza motrice. ... Vogliamo restituire loro la dimensione dell'onestà e della possibilità".

<sup>5</sup> Favarese, Favara's inhabitant.

<sup>6</sup> Vespa, Italian motorscooter.

<sup>7</sup> Original text: "incontrare il mondo degli uomini, ossia il mondo reale delle persone reali, con tutta la sua ricchezza di rapporti pluridimensionali, conflittuali o armonici, complementari o contraddittori, essenzialmente fluidi".

(Gibbons, 2000, p. 159). The interactive paradigm proposed by Kirby, Graves & Reid (2010) was a solid base to set the ethnographic investigation in order to understand the dilemma of complexity (Toni & Comello, 2007) of that determinate scenario.

#### 4. Discussion and theoretical frame: how creativity and education could enhance community development

##### 4.1. Ethnographic fieldwork: Favara and *Farm Cultural Park*

According to Campbell & Lassiter I investigated “one scene, many positions” (2015, p. 54) during my several stays in Favara. The town is located in the immediate hinterland of the Southern coast of Sicily, just ten kilometers far from the famous Temple Valley. As Cacciato explains (2015) the major part of the South part of Italy was suffering from economical depression, and from demographical collapse. Although these premises, in his book with the eloquent title “The South flies” (2015) he testifies how innovative start-ups are boosting the Sicilian economy. He dedicates an entire chapter to the phenomenon of rebirth of Favara thanks to the visionary idea of two private citizens who decided in 2010 to set a creative and cultural center in the historical part of the town. It is curious that Favara is not only a toponym, but also a common Sicilian word that means “spring of water”<sup>8</sup> (Arnone, 1997, p. 73). Although the citizens are not benefiting from running water, the city is *source* of inspiration for many people that believe that offering their children a better world is possible. In 2016 the cultural center counted 78.000 visitors, offering a carnet of 162 cultural events in 1750 square meters and hosting 90 creatives-in-residency<sup>9</sup>. It attracts not only visitors from outside, but carries out a social function, in developing sense of community. The aim is offering to local citizens and their families a space that educates to beauty. Talking about beauty St. Thomas wrote that “true, beautiful and good ‘inter se convertuntur”<sup>10</sup> (cited in Vettese, 2006, p. 96). *Farm Cultural Park*’s ambitious project is to create the *Children’s Museum* at Palazzo Micicché. “The aesthetic experience as reflecting experience, regards to feel the presence of the world”<sup>11</sup> (Morelli, 2010, p. 44). The spark that moved Andrea Bartoli and Florinda Saieva, the couple of private citizens, who came up with the idea to set in Favara their project, was the collapse of a ruined building in the abandoned area, which caused the death of two children (January 2010). In order to give in dowry their daughters the possibilities of a new future they bought the ancient block of 7 *Cortili* and they started to realize their vision with the concrete action of regenerating the urban and social tissue. The result is an ongoing cultural process, began with the rehabilitation of the beauty of the historical palace, the building of EX-Large contemporary art gallery, set in a microcosm in which the previous few inhabitants are still living. The over the hill *aunts* maintain the historical memory of the site. According to Morelli “we are the relationship we are living, and we become the experience we do”<sup>12</sup> (Morelli, pp. 40-41). *Farm Cultural Park* offers an example how intergenerational living could link tradition with innovation. In an autopoietic view (Maturana & Varela, 1985) the founders were able to feature a network of people sharing their vision, evoking and acting new material and immaterial opportunities. Those virtuous connections established new developmental processes that led the American *Curry Stone Design Prize*<sup>13</sup> to list the project among the 2017 winners, in the section “*Can we design community engagement?*” The knock-on effect impacted on many other cultural initiatives operated by private citizens, two of the pack: *Palazzo Cafisi*’s cultural agenda or *Marzipan, The museum of the almond*. “The richer the experience of the person is, plentiful will be the materials at disposition for his/her imagination”<sup>14</sup> (Mecacci cited in Vygotskij, 2010, p. 27). Fostering education through imagination and creativity is the core of all activities for children and adults proposed by the center embracing education for children and lifelong learning. Engeström offers a suitable hint in saying that “expansive learning is learning what is not yet” (Engeström & Glaveanu, p. 516) for a city which is writing its tomorrow: “the future is not written, but it is meant to be done. It is multiple, indeterminate and open to a great variety of possible futures”<sup>15</sup> (De Toni, Siagri & Battistella, 2015, p. 9). Since 2016 *XL Gallery* hosts the *Sou - School for Architecture for Children*: one-year educational program for 20 pupils age 7-12 divided into three architectural firms involved in theoretical and practical labs. “A necessary part of

<sup>8</sup> Original text: “sorgente d’acqua”.

<sup>9</sup> Data provided by *Farm Cultural Park*’s official presentation.

<sup>10</sup> Original text: “vero, bello e buono ‘inter se convertuntur”.

<sup>11</sup> Original text: “L’esperienza estetica in quanto esperienza riflettente, riguarda il sentire la presenza del mondo”

<sup>12</sup> Original text: “Noi siamo le relazioni che viviamo e diventiamo le esperienze che facciamo”.

<sup>13</sup> <http://currystonedesignprize.com/socialdesigncircle/>

<sup>14</sup> Original text: “Tanto più e ricca sarà l’esperienza dell’individuo, tanto più abbondante sarà il materiale di cui la sua immaginazione potrà disporre”.

<sup>15</sup> Original text: “L’avvenire non è scritto, ma resta da fare. Esso è multiplo, indeterminato e aperto a una grande varietà di futuri possibili”.

education is learning from experience, because it is the empirical material which is systematized by the verbal education”<sup>16</sup> (Baldacci 2009, p. 90).

#### 4.2. Spreading of cultural activities from Favara to Sicily

*Farm Cultural Park* is set in Favara but has a “resonance” (Rosa, 2016) that affects other Region’s realities. Thanks to the competition *Boom Polmoni Urbani*, a call in which *Farm Cultural Park* acted as partner, other areas in urban contests have been rehabilitated. The three winner projects were *Street Factory Eclettica* (sport-cultural-artistic incubator fostering talents) in Caltanissetta, *Periferica* in Mazara del Vallo (TP) (participant projection in an abandoned quarry) and *Trame di Quartiere* (performing and audiovisual lab developing social theater) in Catania. All the projects are engaging in activities in marginality areas with the common denominators of creativity, community, culture, education.

#### 5. Conclusion: expected outcomes

This research outlines how the civil society through the development of educational projects based on creativity is able to enhance a virtuous circle that lead to community development in order to struggle against unemployment, brain drain, destitution, ignorance and illegality. Without making specific reference to EU Commission’s recommendations Favara is undertaking its criteria, thanks to the stamina of its citizens. Nelson Mandela’s renowned saying “Education is the most powerful weapon which you can use to change the world” is *Farm Cultural Park*’s motto. It is a powerful choice in a country fame for the use of the lupara<sup>17</sup>. Through the ability to communicate and to build network *Farm Cultural Park* in ten years has been able to virtually redouble its citizens: now (h. 5 p.m., 5/16/2017) its FB’s page counts 54.444 followers all over the world. By bringing together the elements with cultural sensitivity, economical models, using the political opportunities, and entering into an educational process, Favara is an example showing how EU 2020’s agenda could be achieved in areas of marginality. Its model is worthy to be reproduced in other depressed European areas.

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<sup>16</sup> Original text: “... l’apprendimento dall’esperienza è una componente necessaria della formazione, in quanto è il materiale dell’esperienza che viene sistematizzato dall’istruzione verbale”.

<sup>17</sup>Lupara, shotgun usually used in the executions among the Sicilian organized crimes.

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# CHANGING THE PARADIGM. THE EMPATHETIC APPROACH TO PROBLEM SOLVING IN ENGINEERING EDUCATION

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## Abstract

In many countries engineering education has been run in a traditional and well acknowledged way emphasizing the quality aspect of technological expertise, however not always exploring deeply enough perceptions and necessities of the target audiences for whom technological developments are created as well as perceptions of young generations of technical university students who are the main actors of the educational process. Considering new challenges arising from continuous global political, economic and technological changes that are inherently connected with mentality changes, there arises a need to adapt educational approaches to the new demands. The article aims at presenting an innovative curriculum scheme used by the Lodz University of Technology, Poland, that attempts to combine the above factors and look at education from a different angle, the angle that allows to include empathetic perspectives of the actors involved in an educational process, students and teachers, as well as the perspective of potential recipients of the solutions generated by the technology developers. A few year experience in the human-centred approach to problem solving in an engineering education at the Lodz University of Technology results in salient reflections presented in a qualitative and quantitative form that are used to create guidelines for modelling engineering education so as to increase its positive impact on the success of young generations of engineers in a dynamically changing international context.

*Keywords: Engineering, education, problem-solving, human-centered.*

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## 1. Introduction

We are living in the times of dynamic changes provoked by complex factors such as globalization, political instability, increasing competition, climate change, fast technological developments, growing world population, mass migrations. Liquid reality described by Z. Bauman (Bauman, 2007) constitutes a shift from stability to precariousness and a constant change mixed with uncertainty. The challenges that future societies will be facing in numerous spheres: social, economic, technological and political call for innovative solutions, unimaginable to be developed without engineering technologies that are “woven into the fabric of our society” (Grasso, Burkins, 2010). Nevertheless, numerous universities across the world seem not to acknowledge this upcoming challenge and still attempt to “educate the 21<sup>st</sup> century engineers with a 20<sup>th</sup> century curriculum” (Grasso, Burkins, 2010) focusing mainly on isolated engineering disciplines as if engineering were not linked with a broader socio-economic reality and technological solutions were not developed for specific recipients, who become owners of these solutions and the owners of the problems the new developments may potentially create. The salience of the engineering education profile of today and tomorrow is additionally emphasized by exceptionally powerful impact of technological advances on the way we live, work, communicate, travel, and think (Olsen, 2013). The revolutionary changes that technology has been triggering in the lives of individuals and societies since the beginning of the 20 century constitute a sound argument for asking serious questions about education paradigms that determine the skills and influence the way of thinking of the generations of engineers, important agents of change in the contemporary world.

## 2. Attributes of a new paradigm

The paper aims at presenting a new curriculum scheme that attempts to address the biggest challenges of the changing reality, a scheme that was being constructed in a continuous dialogue in the group of academics at the International Faculty of Engineering, Lodz University of Technology, the

dialogue ignited by the transforming environment that poses challenges to industries, businesses, universities, students. The discourse inevitably has led to a conclusion that engineering education, however strongly it is devoted to excellence and quality factors, seems not to acknowledge the determinants of the context it functions in, and as such, is not linked enough with the environment it is rooted in, its factors and agents. The existing paradigm focuses on the premises of education that were positively verified by experience such as for example high level of engineering knowledge, and being so they have guaranteed reliability and its high quality. Those premises have been cherished and protected by the academics as a foundation of the education scheme. On the other hand, the missing links with the impact factors of the context naturally work against education reliability and quality since they isolate the otherwise valuable paradigm from the real world and that is why it cannot adequately prepare students to an inevitable change that the future will bring. As a result of the above mentioned discourse and several attempts to change the educational paradigm used at TUL, the decision was made to partially base engineering education on a problem-based approach and simultaneously implement an element of empathy into an existing study program that will allow it to open towards various impacts coming from the external and internal changing environments and as a results will make it more responsive to the demands of those impacts. The new scheme being presented here adheres to the following fundamental premises that combine the existing engineering education principles and new values which allow the former to imbed into the turbulent reality:

### **2.1. High quality engineering**

Having in mind the role of engineering in our societies as the field responsible for solving complex problems and creating new ways it has to be admitted that mastery in engineering stays and will stay crucial in the knowledge-oriented economy. However, the future curricula will have to focus on cross-discipline-based knowledge acquisition combined with a holistic engineering that will allow to address complex problems and systems (Grasso, Martinelli, 2010). Due to fast changes in technology and research, knowledge acquired today may become obsolete in several years and that is why future engineers have to be equipped with an ability to learn how to learn, share knowledge and autonomously acquire and create it, often in collaboration with others, as to be able to use cutting-edge technology to solve problems.

### **2.2. Real life problem solving and critical thinking**

Addressing the future demands, engineering curricula have to admit high complexity of problems and systems that the future may bring. As a result education requires to be complex-system oriented with a strong emphasis on the development of abilities that help students understand the context in which the systems and problems are rooted. High complexity is inevitably connected with a necessity to introduce an ability to combine various disciplines into the process of generating innovation (Clough, 2004), ability to cross the discipline borders, respect other points of view, however different they might be, since only this approach can allow a possibility of highly innovative solutions. Respect for different points of view represented by other stakeholders is obviously easier to achieve due to an ability to look at problems in an emphatic way.

### **2.3. Autonomy in learning and decision-making**

There is a real need to make a shift from a traditional approach to learning, in which a student is closely instructed on the way to take, to a problem-based approach in which a student is challenged with a weakly defined problem and a decision-making process to find a solution based on what he/she already knows and what he/she does not know yet. Unstructured problems of complex systems call for an ability to be independent in acquiring new knowledge required to address complexity, but also call for courage and skill to be autonomous enough to think independently, make decisions and create new solutions.

### **2.4. A global mindset**

There is no doubt that engineers of the future will have to work and function in the world that will be even more globalized than today with even less accentuated boundaries created by distance, space or time. Diversity of perspectives may also create a real opportunity of higher innovation and competitiveness. Considering the above, foreign language competences and virtual collaboration combined with increased intercultural competencies will constitute a real competitive advantage and should be incorporated into engineering curricula. Distance and virtual collaboration bring a requirement for a more enhanced empathy competence that will enable virtual collaboration to be more effective.

### **2.5. Creativity and Innovation**

With more and more globalized and more competitive context young engineers will have to function in, innovative approach and creativity seem to be a salient factor of success (Kelly & Kelly 2013) on a job market necessary on an individual and organizational basis. Again, this requires interdisciplinary

approach and interaction with public needs and as such calls for abilities to communicate with audiences outside of engineering disciplines on sometimes difficult and controversial issues. Empathetic understanding of different stakeholders involved in the research process will be a skill of tomorrow in engineering practice.

## 2.6. Collaboration, teamwork and leadership

Ability of collaboration with other engineers, often from different cultural contexts as well as with people from different fields of expertise seem to be a fundamental requirement for survival for future engineers, however might not be enough to be successful without leadership abilities. Again empathetic approach seems inevitable for understanding different points of view to achieve synergy and successfully collaborate in intercultural and interdisciplinary teams as well as lead with innovative solutions.

## 2.7. Empathy

Considering majority of the above-mentioned premises of engineering education as those that require empathetic approach but primarily acknowledging business and technological considerations, it has to be admitted that competitiveness in engineering depends more and more today on product desirability and creativity as perceived by end-users and other stakeholders (Mattelmaki, Vaajakallio, & Koskinen, 2014), which can be achieved through increased immersion and involvement of empathy in the research stage resulting in a problem definition and solution generation. More and more today, are human values placed together with technological and business values in order to create a more participatory approach of contemporary complex problem solving (Walther, Miller & Sochacka, 2017) as it is done at Stanford's d. school which values the involvement of a wide range of stakeholders in the design process.

## 3. The new education scheme

Considering the important premises identified by academics in the process of discourse based on experiences resulting from the implementation of novel elements into the university curricula, The International Faculty of Engineering introduced a project-based education in teams for all students of the fourth semester including problem-based approach with an emphasis on an empathetic research involved in the process of project execution and solution creation. Although used in a variety of forms, the scheme in its most optimal version consists of a project conducted by an international team of up to five students who are challenged with an unstructured problem rooted in a real-life situation that is experienced by a company. The core element, a project, is accompanied by a module on Design Thinking methodology, that leads students through an empathetic research. They learn the DT methodology parallel to the project development, and apply it in their own projects. A team building and communication module assists the students in the development of communication skills necessary for the project execution and supports them in maintaining their team in an optimal condition for successful collaboration. Design Thinking was selected as a method but also as a "vision of how designers can think and innovate in ways that apply to all settings and a range of human needs, always involving a drive towards innovative problem solving." (Pepler, 2017) As a method "distinguished by its reliance on empathy" (Pepler, 2017), it is "linked to increased prosocial, helping and compassionate behavior." (Pepler, 2017) Design thinkers "develop empathy by observing and interviewing users, watching and listening carefully and [...] derive insights based on the user's experience." (Pepler, 2017) With PBL and DT approaches the students are forced to be autonomous in problem research and definition and focus on an extensive empathetic human-oriented attitude to the end user, explore the context in an insightful way, learn about existing solutions, generate multiple innovative ideas to create a new solution, build prototypes and test them again on the owner of the problem in order to check how well it satisfies the needs of usability, practicality and desirability. Not only is the process framed with empathy stages at the very beginning and end but, being iterative in its nature, it encompasses empathetic approach throughout in order to get closer to the desires and needs of the audience that the team is trying to address while innovating with their solution.

The new scheme does not only change the perspective of the students due to its empathetic angle and a necessity to respect it in order to be able to innovate but also changes the role of a teacher who has to shift from an instructor to a process facilitator, which in turn contributes to the development of student autonomy in project execution beginning from empathetic research and finishing with decision making on the most desirable and innovative solution. The process of change has not been easy for academics. It required, new information and skill, role change and, what is more crucial, a will to change. It demanded extensive training in order to learn how to only assist and coach students on their way to independence and autonomy, and not to intervene when they are on the verge of failure. Considering the audiences involved in the process of empathetic project-based education, the most important is the group of end-users to be observed, interviewed and to immerse in the context they function in as to deeply explore their experience and make the right conclusion on its improvement. However, there are a few university

groups responsible for an over-all coordination of the process that have to be referred to: an international and multidisciplinary team, a team mentor, a team building and communication skills mentor, a DT coach and a faculty coordinator. In relation to the team, the mentors and a coordinator play the roles of facilitators which means the students have the right to consult ideas but not the right to ask for ideas or solutions. The tutors do not interfere in the process or take an initiative to intervene, which may result in the risk of failure, nevertheless this is treated as a source of experience to learn from. It is important to emphasize that all the entities, external to the team, stay in contact and are obliged to meet with one another based on a previously decided schedule to exchange the information and make decisions on how to improve the process. All the actors involved, meet at least three times in the semester to exchange and share progress.

In the process of research and solution construction, the focus on empathy and iteration directs the team to different stakeholders with the end-user as the main point of reference that would best address the desires and needs of the audience waiting for a solution. Innovative presentation techniques are used such as pecha-kucha or speed-geeking presentations in order to create an opportunity for the team to collect feedback from all the academic and non-academic actors and stakeholders since they are invited to consult the results. The projects are evaluated based on the presentation of progress at the mid-term and the output at the final poster presentation sessions with a Q&A part as well as written team reports in the form of articles. The evaluation panel consists of all the mentors involved in the process and company representatives. Team building and communication skills module is evaluated based on a reflective essay written individually and continuous assessment during the process. There is an element of self and peer evaluation involved as an attempt to empathically increase the perceptions of all team members.

#### 4. Student perceptions of the new study scheme

The research presents partial results from the questionnaire that is still in progress as well as descriptive results received in a reflective essay written individually by each student. So far, the response sample comprises the group of 20 Polish students, at the average age of 20, representing various engineering disciplines and working in project teams within the course presented above (10 ECTS); and the group of 20 international students at the average age of 23.3 representing various European cultures and engineering disciplines who participated in a bigger (20 ECTS) but similarly organized team projects. In the questionnaire the students were asked if the human-centric-design study scheme based on the premises identified as important by the group of academics is perceived by them in a similar way, specifically if the programme helps them acquire new knowledge, ability to solve problems, learn to be independent at problem solving, develop creative and teamwork skills, and empathetic approach to stakeholders involved in the process. The following table presents the perceptions of students working in all-Polish project teams and international project teams.

*Table 1. The number of students identifying the skills they acquired in the new study programme.*

| Acquired Skill          | Polish Students | International Students | Total |
|-------------------------|-----------------|------------------------|-------|
| Acquiring new knowledge | 20              | 16                     | 36    |
| Problem-solving         | 16              | 15                     | 31    |
| Autonomy                | 10              | 15                     | 25    |
| Creativity              | 10              | 16                     | 26    |
| Teamwork                | 17              | 17                     | 34    |
| Empathy                 | 14              | 18                     | 32    |

As the first results of the research indicate, substantial majority of the students acknowledge the new paradigm as a very good way of acquiring new knowledge, teamwork, empathetic research and problem-solving skills, and majority of them value it as a way to acquire autonomy and creativity. There are, however, visible differences in the perceptions of students working in all-Polish and in international teams.

The above ideas are further developed in a reflective essay that the students were asked to write individually at the end of the process. The essays indicate, beyond any doubt, that the empathetic approach in research allows the students to ‘understand the problems better’<sup>1</sup> because of getting ‘a broader view on the problem’ and being able to see it ‘as it is seen by the end-users’, ‘focus more on the target group than just on the product itself’. Due to ‘more hands-on project experience’ and ‘real-life experience’ as well as ‘an opportunity to learn from each other while working in a multidisciplinary team’ they are able to ‘create more intelligent solutions because [they] are thinking more about the needs of the other’. Again, the reflections expressed by an international team seem to emphasize in a more vivid way a

<sup>1</sup>The quoted remarks in this paragraph are citations from the students reflective essays.

real benefit of an empathetic approach to different stakeholders in the research and testing stages, which results in a more positive impact on the final solution and its innovative angle.

## 5. Conclusions

Although the group under research is at the moment small, it is interesting to notice that more international students find the new paradigm beneficial as a vehicle to learn how to be more creative in problem solving and be more empathetic in researching the needs of end-users and other stakeholders as well as the way to become more autonomous in their work. A bigger number of Polish students than international students found the human-centric approach a good way to acquire new knowledge whereas both groups identified this approach as a positive means to learn how to collaborate in a team and solve problems. The comparison of the two groups indicates that an empathetic approach in the process of problem solving is considered to be more beneficial by international teams than by teams comprised solely of Polish students.

The conclusions from reflective essays seem to confirm the questionnaire results. The students value a new paradigm as more engaging, creative and leading to more innovative solutions, which better address the perspective of the recipients due to an empathetic approach. In addition, Polish students call for more international context and more variety of disciplines to be involved in team structure.

Summing up, it can be concluded that the new empathy paradigm has its real value in bringing a new perspective to engineering education. However, it appears evident that high level of team internationalization and discipline diversification contributes, in the eyes of students, to higher creativity and provokes the need for a more empathetic communication with in-groups and out-groups, experts, end-users and other stakeholders. Creativity and diversity factors should be, then, correlated and taken into consideration while structuring future project teams and researching future results. The introductory research results presented here will constitute a basis for more extensive quantitative and qualitative research. Thus, recalling the words of one of the “old masters”, an engineer “must adapt his creations to fit man, rather than the other way around” (Arnold, 1955) and “the design of industrial products should be an extremely multidisciplinary activity and much more creative.”(Clancey, 2016)

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## CHALLENGES IN HIGHER EDUCATION: INVOLVING STUDENTS IN THE DYNAMICS OF SCIENTIFIC KNOWLEDGE PRODUCTION

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### Abstract

Society is currently contending with numerous problems for which, in many cases, no solutions have been found yet. One of those major issues is unemployment, which affects the population as a whole but has damaging repercussions on students attending higher education (HE) institutions and is hugely demotivating for them. Measures to combat student failure in education, often caused by this lack of motivation, have not been effective so far and need to be urgently revised.

In this context, a study of qualitative nature was planned in order to assess how influential is the effective and active involvement of HE students in the dynamics of the production of scientific knowledge as a way to promote motivation and success in education.

This essentially theoretical article reviews projects conducted to fight students' dropping out of HE; it stresses the importance of young people getting involved in the dynamics of research in HE and relates this measure to the kind of motivation and progress felt by students throughout their studies.

**Keywords:** *Challenges in higher education (HE), Dynamics of the production of knowledge in HE, Student motivation, Progress in studies, Dropping out of HE.*

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### 1. Introduction

The existence of some major problems that have been plaguing the world- issues such as hunger, poverty, unemployment- led the United Nations to require the extension of the Objectives of the Millennium Development Goals (MDGs) and to their conversion into 17 sustainable development goals (SDG) that each country has adopted (UNRIC, 2016).

Reducing unemployment rates is one of the essential goals upon which the development of any country must be based.

High unemployment rates seem to be one of the factors that cause a feeling of deep frustration among many thousands of young people who are entering higher education Institutions (HEI). This discomfort causes higher education indecisiveness, as well as school failure and successive school dropouts (Cardoso, Escária, Ferreira & Raimundo, 2014).

In view of this situation, a variety of measures have been adopted in order to promote the success of all students. Nevertheless, such measures have not yet produced the intended effects.

This is an extremely complex problem that a wide range of young people with a wide spectrum of interests, expectations and motivations – people in which we have to include the Millennials (McBride & Nief, 2011; Starlink, 2004), the neet (Benjet, Hernández-Montoya, Borges, Méndez, Medina-Mora & Aguilar-Gaxiola, 2012) and the generation Z (Töröcsik, Szűcs & Keh, 2014) has to face the way they never had to before. We can't forget that many of those young people are acclaimed by the media for their exceptional skills (Töröcsik, Szűcs & Keh, 2014).

In order to solve this situation, several authors (Taylor & Parsons, 2011; Jenkins, 2003) advocate the implementation of strategies which will help emphasise the importance of a greater intervention of students as far as their academic career is concerned, an intervention which will only become possible through a dynamic involvement in the production of the scientific knowledge itself.

## 2. Objectives and methodology

The investigation was structured with the main purpose to measure the effective and active involvement of students in the production of knowledge and the effect this involvement will have on motivation and school success.

Since the choice of the method should be made according to the nature of the study problem (Bogdan & Biklen, 1994), we thought it would be appropriate to choose a qualitative methodology, a method based on a constructivist and interpretative paradigm, (Creswell, 2003), and with a multiple case study design (Yin, 1994). The data will be collected, essentially, through an inquiry process (questionnaire, focus group and interview) conducted with several participants: teachers, researchers, students, through observation and documentary collection.

The qualitative data will be submitted to content analysis (Bardin, 2002), sorted by categories that will emerge from the issues and objectives of the research process and of the data collected. The quantitative data will be subject to descriptive statistics.

With this theoretical article, and after having clarified some core terms of the study, we will analyse a few projects that will help fight failure at school and school dropout in HE; we will support the increasing relevance young people have in research dynamics in HE and we will establish the relationship that exists between this kind of measures and the students' motivation and their school improvement.

## 3. Clarification of terms

There are several meanings for this concept of "motivation", which makes it difficult for people to adopt a sole definition (Locke & Latham, 2002).

According to Ryan and Deci (2000), two different types of motivation may be considered: intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to any kind of psychological reward (recognition, status, respect, satisfaction), that varies from individual to individual, which is granted anytime he performs a particular task and whose main aims are to help him achieve his own satisfaction and pleasure. Extrinsic motivation occurs when the rewards are tangible (e.g., salary, promotions, good rank in a frequency) and the goal is to achieve a certain purpose.

Academic failure is perceived, by some, as the inability to achieve the global objectives that have been defined for each course of study and that are embodied by a process of evaluation (Martins, 2007). In this context, the failure indicators that are usually taken into consideration are the retention rates, school dropouts and exams failure.

For others, failure cannot be identified only with this range of objectives defined for a course of study. The International Organization for Economic Cooperation and Development (OECD, 2004) recognizes differences between achieving successfully the objectives previously defined for an educational course and to simply reach them: "Successful completion must be distinguished from simple completion of the programme which is achieved solely through fulfilling attendance requirements" (p. 39).

As already mentioned, school failure (or academic failure) can lead to the students' academic dropout (Ferreira & Fernandes, 2015).

This term – academic dropout - has taken several designations. For example, the glossary of terms issued by the Regulation of requirements of the Porto University, in accordance with law No. 37/2003, defines "academic dropout" according to the students and to the situations in which they are included: AI-registration in a given school year is canceled by decision of the student or the institution's, without loss of registration; AM – registration is cancelled as a result of the student's dropout or by decision of the institution; I – student left the course for lack of inscription, without having graduated; PR- student registration aborted due to repeated school failure .

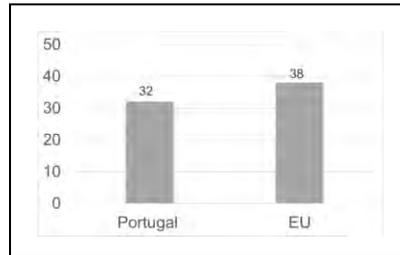
Since we recognize the importance of the meaning attached to those terms in each of these different contexts (mainly to terms like motivation and failure –and dropout, as well) and the importance of getting young people ready to enter labour market, we have to highlight some projects that have recently been implemented in order to better identify the causes of failure and to outline some measures that will help overcome this situation.

## 4. Appointments for the integration of young people in the research dynamics

Since joining the European Union, Portugal has been looking for ways to fight school dropout and school failure, through: (i) pilot projects which offer mentoring and vocational courses and (ii) projects related to improving the management quality in the context of the public HEI missions, promoted by the Portuguese Ministry of Education and Science.

However, recent statistics indicate, for Portugal, that the completion rate of HE among young people between 30 and 34 continues to be much lower than the EU average (Figure 1).

Figure 1. Completion rate (%) of young people between 30 and 34 years. Source: CE (2016).



Against this background, there is an urgent need to implement other measures. Several authors emphasise the importance of effectively including students in research teams and the sooner the better, because:

- i. “can find material that challenges the faculty member’s worldview and expertise” (Windham, 2005, p. 8);
- ii. “can uncover stories and research results that the faculty member has never heard about” (Windham, 2005, p. 16);
- iii. develop intellectually and have access to knowledge as an active and dynamic process (Cabral, 2017);
- iv. develop appropriate skills to make decisions (Santos, 2016);
- v. motivate themselves to continue studies (Taylor & Parsons, 2011).

Others (e.g. Katz & Assor, 2007) stress that students learn better when they feel valued by participating in the activities of a community, and feel more motivated for doing something they have chosen and not what someone tells them to do. Students can thus not only get better results, but also acquire a new interest and an increased motivation for engaging in an open and creative activity, promoting their professional growth. No less relevant, such activities give them greater power to cross the borders between the subculture of everyday life, school and the science knowledge and thus provide them with a better preparation to face the constant challenges that society will throw at them. To that extent, students are part of a culture of learning – where teachers will also learn from their students- a model of horizontal relationship between students and teachers (Taylor & Parsons, 2011).

## 5. Initiation to the integration of young people from HEI in the dynamics of scientific knowledge production

Both the literature (e.g. Taylor & Parsons, 2011) and the accumulated experience (e.g., Jenkins & Zetter, 2003), in conjunction with institutional goals of many HEI, recommend the integration of young people from ES in the dynamics of the production of scientific knowledge.

However, this integration usually happens only in the last years of the courses, and for the purpose of carrying out Dissertations, internships, projects, and so on.

With such intentions, many countries have been implementing projects that integrate the students in research projects. These intentions are more directly linked to school disciplines like Biology or Chemistry and aim to engage students in the kind of scientific work that is really developed in HEI.

The contribution of such strategy is to expose students to learning opportunities that are relevant to the real world, and to get students to contribute to the body of scientific knowledge. As an example, the *FoldIt* project involves the students, and their teachers, in tasks that will develop problem-solving skills puzzles about why and how proteins fold. Another project -*The USA Phenology Network* - offers two possibilities of involving students in research. First, students can take the role of observers. To be an observer, the site guides them to identify plants and animals they can observe in their region. It also guides the students so they can select the appropriate location for observation and register online to present the data they have collected.

The second way leads students to collect historical data from handwritten letters, from the late 19th century, which carry information about the phenology of birds. The students may act as assistants during the analysis of these letters which have to be scanned and will help record the information in a given database.

Other authors (e.g. Jesus, 2008) support these aspects, recognizing the importance of creating situations in which students may come to play an active role in the construction of their own knowledge. In several countries (e.g., Finland, Luxembourg, Portugal) research is part of some teacher` training courses (e.g. Kansanen, 2014, Poncelet, Reuter, Kerger, & Bourg, 2009) in order to bring students to recognize the importance of research, and to show them the results of the research conducted. In addition, in contexts of pedagogical practice, these students will have to develop small investigations programmes under the supervision of their Advisor.

However, this is not how the present study suggests the integration of the students in the dynamics of the production of knowledge should be carried out. The intention is to achieve an effective involvement of the students in the work conducted by research teams that are already established, so that they can actually experience the different steps of the work process and reflect on how important they were for the final outcome of such process, on the difficulties they experienced and overcame. These experiences will surely be very valuable for their academic life (and for their motivation as well) and even for their future.

It would also be interesting for teachers` training courses to include a syllabus of ' Initiation to Research ', from the early years of the course, in which students would effectively take part in the dynamics of the production of knowledge and take a real responsibility for the constructing their own knowledge.

We are certain that this would motivate them to improve their academic competences and to develop other skills which are fundamental to enable them to face current challenges. Studies in HEI are in agreement with such inclusion (Cabral, 2017). According to this author (Cabral, 2017), students will go through an intellectual development and they will see their access to knowledge as an active and dynamic process. On the other hand, the teachers will improve academically and professionally as well, as they adopt this attitude of sharing and of constant questioning.

## 6. Conclusions

In the light of dilemmas or uncertainties that young people face when entering pre-university, the present investigation exposes some relevant evidences that support your dynamic insertion in the production of scientific knowledge to strengthen and motivate progress studies. In particular, the analysis of literature on the subject made it possible to identify some dimensions of the practices that need to be reviewed with a view to addressing the challenges currently facing young people. One of them is to give a greater involvement of students in the production of knowledge through research. It is assumed that, surely, will motivate to continue studies. In this sense, the curriculum and the orientation of the courses of ES should be organized to make students to be producers and not just consumers of knowledge (Cabral, 2017).

In short, integrate the research practice in the teaching and learning process is a means to achieve a more solid education for the young people who join in ES because they confer a greater power and thus prepares them better to face current and future challenges. There are, as well, new challenges to students, greater responsibility for their studies that involve sharing of tasks and decisions with their peers, decision-making and problem-solving situations.

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# MAXIMIZING SELF-CONFIDENCE, LINGUISTIC ASSIMILATION AND CULTURAL AWARENESS USING INTERACTIVE EXCHANGES IN THE FRENCH LANGUAGE CLASSROOM

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## Abstract

Interactive native-speaker exchanges facilitate communication with native speakers of the target language (L2) that mimic the immersion experience and supplement the communicative classroom. The use of video-conferencing tools may enhance aural skills, intercultural awareness and global competence. This interactive presentation will assess the use of *TalkAbroad*<sup>TM</sup>, a proprietary application, as an integral part of the Intermediate French language curriculum and classroom at the College of Saint Benedict and Saint John's University (CSB/SJU), in Saint Joseph, Minnesota, USA. We will present the experience, conducted from January 2016 through May 2017, and discuss its results: how it can engage students, inspire motivation and autonomy and boost linguistic skills and intercultural understanding. We will assess its possibilities and challenges and demonstrate, through data collected, that the use of interactive exchanges in the foreign language classroom enhances language learning. The use of innovative technology, such as the TalkAbroad platform, has proven to impact positively students' perception of confidence levels in the target language, of foreign language learning, and of overall global awareness and intercultural competence. Tools such as TalkAbroad seamlessly integrate the guidelines of the American Council on the Teaching of Foreign Languages (ACTFL) and the skills deemed essential for 21<sup>st</sup> century learners.

**Keywords:** *Higher Education, Technology in Teaching and Learning, Global Competence, French Language Learning, Interactive Language Exchange.*

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## 1. Introduction

The American Council on the Teaching of Foreign Languages (ACTFL) has promulgated World-Readiness Standards for Learning Languages (Phillips & Abbott, 2011). These recommendations are grouped in general goal areas known as the “the five C’s”: Communication, Cultures, Connections, Communities and Comparisons. For instance, students should be able to converse and negotiate meaning in the classroom; their study should include opportunities to compare and reflect on different cultures and create cross-cultural relationships. The standards also specify that multimedia approaches are especially useful in building community relations.

It is generally accepted that relevant face-to-face contact with native speakers of a language will have a positive influence on language learners' global skills and is consistent with the research-based ACTFL standards. However, when personal contact is impossible, can technological substitutes aid students and teachers in attaining those goals? A long history of the use of audio-visual materials is encouraging as to the general pedagogical utility of such devices (O'Rourke & Stickler, 2017). Of particular interest is the technique of video conferencing for language learning.

### 1.1. Video conferencing

Video conferencing falls into a category of language learning strategies sometimes termed computer assisted language learning (CALL), computer-mediated communication (CMC), and more specifically synchronous computer-mediated communication (SCMC). O'Rourke and Stickler (2017) defined synchronous communication as “dialogic communication that proceeds under conditions of simultaneous presence (co-presence) in a shared communicative space, which may be physical or virtual” (p. 2). Video conferencing clearly falls in this definition. It allows students to practice the foreign language (“L2”) skills and modes of communication indicated in the ACTFL standards: It has the

potential to help students learn how to negotiate meaning, and how to assess and evaluate information. In the French foreign language classroom, it also has the potential to facilitate student learning about francophone countries and regions and their cultural customs, practices, and perspectives. Video-conferencing tools permit the integration of technology to enhance learning and use of the language beyond the classroom, in a more authentic setting, which mimic the immersion experience.

The specific applicability and efficacy of modern video-conferencing tools is currently the topic of much research. Jauregi (2016) has noted the connection between these approaches and social constructivist theories of education. Despite the apparent benefits of the approach, some research shows the difficulty in introducing such methods in traditional educational settings (Howard, 2013).

Terhune (2016) reported a study with students learning English as a second language. The students used Skype-based conversation in a “relatively uncontrolled setting”. Though motivation is usually considered high for this type of pedagogical intervention, Terhune noted that not all students adapted well to video conferencing. Terhune recommended that future interventions of this type should be more structured with specific tasks and goals.

The limitations of readily available platforms such as Skype has led to the development of pedagogy-specific proprietary software. One such application is TalkAbroad™.

## 1.2. Project goals

The general purpose of the larger study is to assess the use of TalkAbroad, its possibilities and challenges, in light of the ACTFL standards. In the current paper, our aim is to assess the pilot pedagogical intervention. We will focus attention on some pre-conversation baseline questions: Have students travelled to places where foreign languages are spoken? Have they ever conversed in a foreign language more than ten minutes? How can we characterize the students’ levels of confidence as they prepare for the first video conferencing experience? Once the program has begun, we will assess, after each SCMC video conversation, how students perceive their own performance: do they think that they learned anything new about the language and culture of their conversation partner? How does their confidence evolve along the experience? Taking into consideration the recommendations of Terhune (2016), the intervention will be structured with specific tasks for, and assessment of, the students.

## 2. Methods

### 2.1. Participants

Students from four different sections of intermediate French participated in the study— two sections in the spring of 2016 ( $n=17$ ); two in the fall of 2016 ( $n=20$ ). While 37 students took part in the study, 36 provided complete usable data. Participants were predominantly first-year and second-year students, with varying majors (though no French majors were in the groups). Most students had taken French in high school (anywhere between 1 and 4 years) and were either in their first or second semester of French language at the university level.

### 2.2. Measures

A pre-conversation questionnaire established baseline information about the students’ perceived skills and motivation (sample items: Have you ever conversed with a native speaker for more than 10 minutes? Have you ever visited a country/region in which French is spoken?). After each individual conversation, parallel questionnaires provided information about how each conversation progressed and on the evolution of perceived confidence in understanding and speaking (sample items: I understood most of what my conversation partner said; Overall, the conversation was harder than I anticipated). Most items were answered yes/no or on a six-point scale anchored at the extremes with “Strongly Agree” and “Strongly Disagree”.

A scale was constructed with the following four post-conversation items: (a) I felt more confident about my proficiency; (b) My partner understood what I said; (c) I understood what my partner said; (d) The conversation flowed well. The summative combination of these items ( $\alpha = .84$ ) was operationalized as *post-conversation student confidence*.

### 2.3. Procedures

Students were informed in advance of the nature of the upcoming pilot project. In-class preparations began two weeks prior to the first conversation, and consisted of a detailed presentation of the program in order to familiarize students with the technology and procedures of the TalkAbroad platform, as well as a short writing assignment whereby students expressed their own learning expectations. Additionally, we collected baseline information in a pre-conversation questionnaire. Four

individual conversations of 30 minutes each were planned during the semester. The students in the two sections in the spring of 2016 conducted four individual conversations, with no restrictions on the partners chosen; in the fall of 2016, in response to student feedback from the previous spring, students had the option of conducting two group (pair) conversations prior to the next two individual conversations, in order to reduce student anxiety associated with the task (again, with no restrictions on the partner chosen). All but three students opted for the combination of pair and individual conversations. Approximately a week prior to each conversation students received an assignment with prompts for the conversation, with topics addressed concomitantly in class. Students had a period of a week to complete each of the four assignments. They were encouraged to meet with a teaching assistant in order to prepare some initial questions and topics for discussion, following the prompts provided. Though not required, most students took advantage of this opportunity. Each individual conversation was recorded so that the content could be accessed for assessment purposes. Conversations were evaluated according to (a) completion of the 30min; (b) addressing all topics assigned; (c) ease and fluidity of conversation, absence of English, overall oral comprehension and correct use of language topics put into practice in class. Short post-conversation writing assignments were required, in order to consolidate material addressed in class before the conversation and practiced during the conversation. After each of the conversations, students were debriefed orally in class and questionnaire information was collected regarding perceptions of how the session went. Data were analyzed with SPSS 24.

### 3. Results

#### 3.1. Pre-conversation

Table 1 presents the crosstabulation of responses to the pre-conversation questions “Have you ever conversed with a native speaker for more than 10 minutes?” and “Have you ever visited a country/region in which French is spoken?” Considering the marginal values in Table 1, we see that about 44% of students had travelled to a place where French is spoken and fewer than one in five (17%) had had a conversation of more than ten minutes in French. Only one student reported having a ten-minute conversation in French without having travelled to a French-speaking region. The association was tested by Fisher’s exact test, and is statistically significant ( $p < .05$ ).

Table 1. Ever visit place where French is spoken BY Ever converse more than ten minutes.

| EVER CONVERSE<br>> 10 MIN? | EVER VISIT? |     | Total |
|----------------------------|-------------|-----|-------|
|                            | NO          | YES |       |
| NO                         | 19          | 11  | 30    |
| YES                        | 1           | 5   | 6     |
| Total                      | 20          | 16  | 36    |

#### 3.2. Post-conversation

Figure 1 shows average student response to the question “Did you learn at least one new thing related to the language” along conversations 2, 3 and 4. Average agreement increased at each successive conversation ( $F_{(2, 58)} = 3.036, p = .056$ ).

Figure 1. Repeated measures: Learned something new in language in conversations 2, 3 and 4.

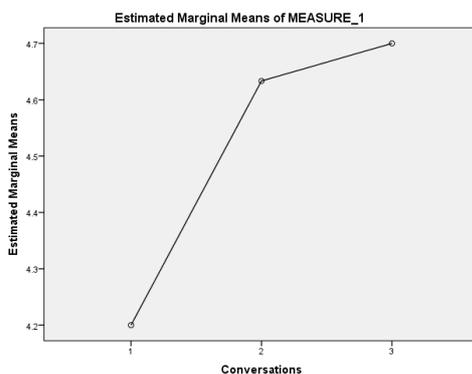


Figure 2. Repeated measures: Learned something new in culture in conversations 2, 3 and 4.

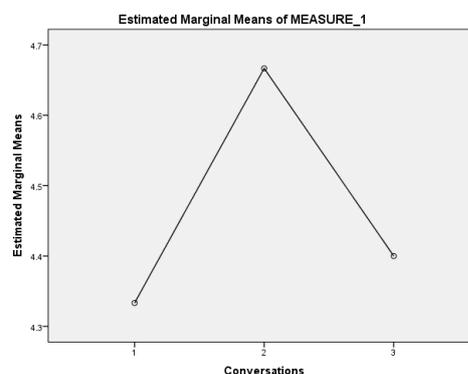
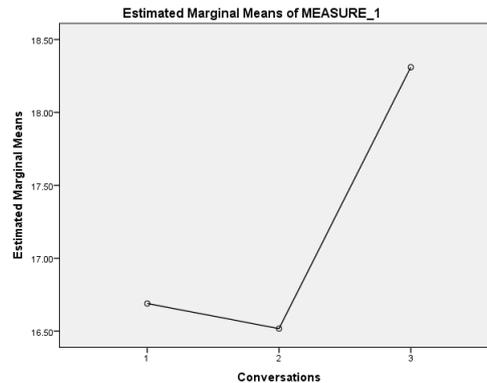


Figure 2 shows average student response to the question “Did you learn at least one new thing related to the culture?” along conversations 2, 3 and 4. An increase in average agreement was observed at conversation 3; average agreement with the item fell at conversation 4. The observed differences were not statistically significant ( $F_{(2, 58)} = 0.933, p = .408$ ).

Figure 3 presents the mean post-conversation confidence along the several SCMC conversations. A slight decrease is evident from the initial level. This is then followed by a statistically significant increase in the reported confidence ( $F_{(2, 56)} = 4.243, p = .019$ ).

Figure 3. Repeated measures: Post-conversation confidence in conversations 2, 3 and 4.



Finally, we include here some examples of student comments that were made in the context of post-conversation questionnaires and volunteer student testimonials:

(a) “It gave me a lot more confidence in my French speaking [...] prompted me to work harder in the classroom [...] it mimicked a real life scenario.” (Student #1, FREN211)

(b) “...it was beneficial for me to step out of my comfort zone and try to converse with native speakers to improve!” (Student #2, FREN211).

#### 4. Discussion

Analysis of the five separate questionnaires, completed over the course of the spring and fall of 2016 semesters, suggests that students’ perceived confidence in speaking and listening skills increased with time. Assessment of the oral conversations indicates, as well, that students improved their question-asking skills in L2, which is often neglected in the classroom. Additionally, our analyses suggest that students acknowledge learning specific items of language after each conversation. These elements support the accepted notion that exchanges with native speakers will improve L2 students’ global awareness and intercultural competencies and increase oral proficiency levels. Figure 2 shows a slightly surprising decline between conversation 3 and 4. The decline, though not statistically significant, may have been due to the topic of conversation in the assignment. While for conversation 3 students were asked to speak about their aspirations in life and plans for the future, in conversation 4, the topic was broader, with fewer prompts and centered on international relations and globalization. The latter topic is less palpable and personal, and more complex in nature to discuss in L2. It is not unexpected, therefore, that students did not feel as confident about learning something new about their partners’ culture, for they may have been too focused on using correct vocabulary and structures related to the difficult topic.

Figure 3 shows a large increase in students’ perceived confidence between the second and fourth conversations. While this follows the expected trend, it is interesting that after the third conversation, students reported a slightly lower mean confidence. This may be due to a concurrent decrease in anxiety after the first two conversations. The slight decrease in confidence may also reflect the changed methodology in the fall of 2016: conversation 3 is done individually, while for the majority of students in FREN211, the first two conversations were conducted in pairs. Future analysis may include a comparison between the spring of 2016 and the fall of 2016 groups to confirm or reject this hypothesis. What is important to note, however, is that—regardless of the mode of conducting the exchange, whether individually or in pairs—the students’ perceived confidence at the end of the semester is significantly higher than that at the beginning of the semester.

Table 1 demonstrates that students traveling abroad may not be confident enough to communicate in L2, even though they have previously studied L2 in class. Language exchanges such as the one conducted in the French classroom at CSB/SJU have the potential of improving confidence levels and encouraging the use of L2 when students are abroad, rather than reverting to their native English, simply because it is easier.

The main challenges students indicated were (a) having to navigate the time difference with most francophone countries (only Québécois natives were close in time zone), which limited the opportunities to conduct conversations, and (b) technical difficulties with the platform (audiovisual problems, Internet connection, etc.). Neither of these challenges greatly hindered the conversations and students were able to have productive and worthwhile experiences with their different partners. While regional variations were of concern to the teaching staff, students did not complain about the different accents they heard.

Student testimonials illustrate that language exchanges, such as TalkAbroad, have the potential to increase student motivation and engagement, as well as a sense of responsibility and accountability in students, especially when they are asked to collaborate with a classmate to prepare for their group conversations. Exchanges also have the potential of improving student autonomy, as they require students to utilize their time management skills.

We followed the recommendations of Terhune (2016) and included in the program specific tasks and assessment in a structured environment. This structure may have been key in determining the levels of motivation and engagement observed.

In the spring of 2017, more students took part in the project. Future analyses will compare different groups in the different semesters. Moreover, in the spring of 2017, and in response to student feedback provided at the end of the fall of 2016, class time was allotted to conduct mock TalkAbroad conversations before students experienced the real conversations. The student pairs mimicked the conversation they would be having with their TalkAbroad partner, and addressed the questions in the assignments with each other, allowing for a more relaxed setting to converse and practice.

Because of the success of TalkAbroad at the intermediate French level, its use will also be explored in a French and Francophone culture-focused class, and in a French Phonetics course.

## 5. Conclusion

In conclusion, we can confidently state that out-of-classroom interactive language exchanges using online platforms increase students' perceived confidence in L2, improve their cultural awareness and sensitivity, and global competencies, all the while consolidating linguistic elements addressed in the classroom. They engage the student outside of the classroom, in a more authentic setting. This practice adheres to and integrates ACTFL standards, and places the focus on the learner, allowing for negotiation of meaning, cultivation of collaborative learning, and promotion of a pedagogy that focuses on the whole person, rather than simply on the intellect. Students who have used language exchanges report feeling challenged, but experience a great sense of accomplishment. The authors, and students, recommend the use of such exchanges when possible, not only to complement and enhance in-class communicative language learning, but to develop lifelong skills.

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## DESIGN IN CONCRETE AND ABSTRACT LANDSCAPES IN ARCHITECTURAL EDUCATION

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### Abstract

The physical and cultural space in which the architectural structure is located has always been influenced throughout history. These concepts are constantly reminded us in contemporary design concepts, such as "genius loci", "cultural environment relations in architecture", "place and space" Through the continuous analysis, synthesis and evaluation scientific study method throughout the education of the architects, students are made to analyze the place where the project will be done. However, it is sometimes difficult for students to use this data. In this study, architecture-culture-environment relations in architecture will be examined and examples will be given on the abstract and concrete designs of architectural students.

**Keywords:** *Architectural education; architecture; culture, environment.*

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### 1. Introduction

Architecture is the art and the act of building, organizing and organizing the space and the environment in which the functions and activities related to the human life that constitutes it as a society and an individual will take place. It is necessary for an architectural element to integrate with it in order to take place within the touch that exhibits culture (Izgi, 1999). Art and science of designing and constructing art, creativity and other environments with appropriate definitions, structures and physical surroundings in aesthetic creativity by associating necessary spaces with functional and technical possibilities to enable people to live their lives and to carry on their activities like resting, resting, working and enjoying. (Hasol, 1993).

Architecture is related to nature, geography, climate, geology data and values, which affect each other but complement each other and complement each other and the social phenomena and values within the scope of history and culture, socio-economy, production, It is born and varied in a process that is based on (Izgi, 1999).

Every architectural structure is in interaction and communication with its immediate surroundings. Every artifactual artifacts handled on an architectural scale is influenced by the structural and natural tissue in which it is built and shaped accordingly. Every architectural element is part of the landscape it is in.

In architecture education, students are usually given a design problem in a real environment, aimed at a specific need under the name of architectural design course. The student analyzes this project as a real project, analyzes the project site, and searches the subject. It refers to the plans, sections, appearances, perspectives and models that he has designed with the help of his advisor in a certain period of trial-and-error method. The analysis of the land to be projected in architecture and its rehearsal architectural education and the synthesis and reflection of these data are very important. These include both physical and cultural items.

Briefly summarized in terms of architectural-cultural-environment relation historical process and contemporary design approaches in the study. Then, a small trial project study was conducted to observe the effect of the design for the students.

### 2. Historical process of architecture-culture-environment relations

Text People have always been impressed and influenced by the landscape they are in. First, they built structures to meet their basic needs, which are their housing needs. Spiritual meanings, for example, even in the landscapes they have installed, needed to worship, for example, to meet their needs. As their lives changed and developed and their needs increased, the cultural levels shaped the landscape they were

in and made different places and architectural items that responded to different functions. These architectural elements are an integral part of the landscape at all times and form cultural landscapes. It emphasizes the need for the preservation of ongoing landscapes or the revitalization of new structures called vernacular, according to the definition criteria of cultural landscapes. In this respect, architectural textures in cultural landscapes contribute to the preservation of cultural landscapes in these areas, as they are man-made. This gives us a new clue as to the idea of landscaping and the idea that construction is a whole.

The vernacular architecture has been heavily influenced by building and environment data, materials, and cultivating construction techniques. The place and architecture, even the architectural touch that is found in it all, is a complete and unique place.

### 3. Architecture-culture-environment in contemporary design concepts

With the increase of communication possibilities, there is an effect of globalization in architecture as it is in every area all over the world. However, the importance of being unique and unique in architecture is mentioned in every period. It is a place with the place in the building (cultural landscape). It affects it and is affected by it.

Many things have changed since the cave era where space and work are the same place. After learning how to shape the material, man has tried to save himself from constantly raising it. The place began to be perceived as an urban space during the Renaissance period.

Structure and location relation began to be interpreted differently in contemporary architecture understanding (Pamir, 2009).

a) The relationship between the design of the building and its place and its reflection on the design, finding and using the traces of the past on the urban texture,

b) detaching the building from the ground, placing it on the artificial platform floors, making it completely independent from the structure of the urban touch,

c) the elevation of the structure on the columns and the continuity of nature,

d) building underground,

e) it is a structural design that can be called as a deconstructivist, which tries to resemble the place and the building.

These different approaches are interpreted differently by architects and arise architectural products.

### 4. Design in concrete and abstract landscape in architectural education

In architecture, first class is a period where students have recently met with architecture, basic design and analysis. In this period, students are able to make a project of living unit for housing which they can use basic design theories and drawing techniques. It is desirable for the student to design a living unit with a limited volume of residential space by analyzing it on a real ground (life capsule 1). Then, it is desired to create a utopian land and make a residential living unit with limited volume on that land (life capsule 2). While there are environmental and cultural expressions that guide design in the first study, the latter has only utopia and design scenario. For each study, the student was given approximately one month. Figures 1 and 2 show some examples of these projects (Figures 1 and 2).

*Figure 1. Life capsule design in concrete landscape, first class architecture students (group 1), 2016.*

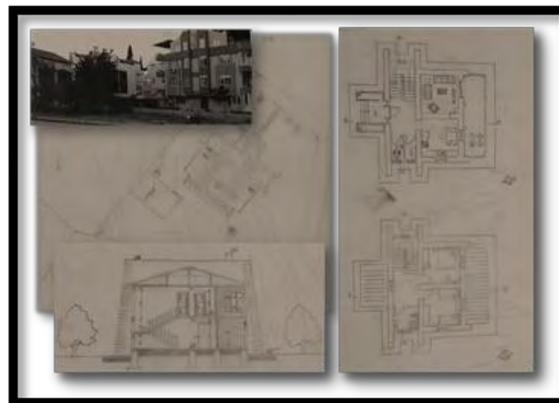


Figure 2. Life capsule design in abstract landscape, first class architecture students (group 1), 2016.



## 5. Results and Discussion

It has been observed that in the analysis made on the real land in the study (life capsule 1), the students were difficult to do the analysis and could not use this information in their designs in general. At the end of the project criticism made with the consultant, it was observed that most of the students showed improvement in the process.

In the second design made on the utopian land (life capsule 2), it was seen that the land created by the students could not go beyond imitating more real places. It is difficult for the student to adapt to this situation, which is the opposite of the previous one. The number of design examples that can be integrated with utopian land created in the same way is very limited. At the end of the project criticism made with the consultant, it was observed that most of the students showed improvement in the process.

In the second stage, interestingly, the student has searched for a place relationship for the building, and the utopian land he has created has played a role as a driving environmental factor in his construction and as a cultural factor in the project scenario. As a result, when design is the product of a number of environmental inputs it is both easier and more successful.

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## STRENGTHENING COMPUTER SCIENCE STUDENTS' ENTREPRENEURIAL SKILLS: A STEP FORWARD

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### Abstract

Lately, the number of Computer Science (CS) graduates who find jobs in startup companies or create their own startup company is increasing. It is imperative to enhance the entrepreneurial and enterprise skills of CS graduates towards following this career path. This paper proposes the integration of two units in the 3<sup>rd</sup> level of the undergraduate studies in order to prepare students to work in a startup company or to launch their own startup. The paper presents the necessary changes for the integration of the two units and discusses the challenges and the benefits for the students.

**Keywords:** *Startups, Computer Science curriculum, Entrepreneurship, Enterprise skills.*

### 1. Introduction

The majority of Computer Science (CS) graduates follow a career path as software developers.<sup>1</sup> Some years ago, the most popular career option for CS graduates was to seek employment in an already established software development company that would provide them a secure income in combination with good prospects for skills enhancement and career development. Recently, however, there is an increasing demand of job posts in startup companies and, furthermore, many graduates take the initiative to launch their own startup. Thus, it is needed that CS students are adequately prepared for these new market demands and entrepreneurial endeavours.

There is an increasing number of articles in online press (Woods, 2013), expressing the belief that a CS degree does not guarantee a software development job to graduates and that other skills are required which are not provided by university education: *“Unfortunately most colleges don't provide all of the skills required for a graduate to become a successful software engineer, ... Without a well-stocked Github account, experience in working with teams, and comfort with practices like unit testing and test driven development - processes that allow small startup teams to continually improve their software without lengthy QA cycles - they [CS graduates] will find it hard to get a great job at a startup.”* Some of the critiques (Gelernter, 2015) go as far as suggesting that *“The people who were good at the school part of CS just weren't good developers.”* Although such criticism should be interpreted with caution, it is important that CS educators ensure that CS graduates get the best possible preparation for the evolving demands of the market.

The area of focus of this paper is to investigate and to identify means of enhancing the enterprise and entrepreneurial skills of CS students so that they become more prepared in order to start their own business and competitively work in the expanding world of startup companies. The CS curriculum at our institution, the International Faculty of the University of Sheffield (TuoS), includes a unit “Innovation and Entrepreneurship in IT,” in which students develop an innovative idea and present it in a pitch, without however the idea being transformed to a minimum viable product. In another unit, the “Industrial Software Project,” students enhance their technical and enterprise skills by working on the development of a full product for an external client. Although both units achieve their goals, the former stops at the critical phase of actually developing a product, and in the latter the project is suggested by clients (and not by the students) and this possibly does not fully motivate students to work on the project due to lack of sense of ownership, interest or commitment. The paper proposes how the two units can be combined so that the Entrepreneurship unit could act as the idea generation and business concept development for the product to be implemented in the Industrial Project.

<sup>1</sup>ACM, Computing Degrees and Career, [\url{http://computingcareers.acm.org/?page-id=8}](http://computingcareers.acm.org/?page-id=8)

The paper is structured as follows: Section 2 presents relevant units from other universities aiming to increase the entrepreneurial skills of graduates towards participating in a startup. Section 3 briefly presents the two units at our institution, proposes how these units can be integrated and discusses the associated challenges and benefits. Finally, the paper closes with some conclusions and discussion.

## 2. Startup Training in CS Curricula

Based on a table of recurrent themes in software startups (Giardino, Unterkalmsteiner, Paternoster, Gorschek & Abrahamsson 2014), a startup is a small company focusing on highly innovative and uncertain segments of the market, competition and finance and facing an extremely high risk of failure. Since resources in a startup are limited, startups usually rely on external solutions such as open source software. Due to high competition, startups have to release a product or a service rapidly. Another characteristic of startups is that usually the development team consists of recently graduated students with less than 5 years of professional experience. Additionally, according to Åstebro, Bazzazian & Braguinsky (2012), entrepreneurship among recent graduates, initiating a startup, is an increasingly widespread phenomenon, suggesting that universities have to reconsider effective ways of enhancing the entrepreneurial skills of students when designing their policies. They also emphasize how the industrial orientation of the programme and the spirit of entrepreneurship can increase start-up activity even in situations with local resource constraints.

While there are many units worldwide that teach entrepreneurship and innovation, only few of them deal specifically with startup training and not all of them are documented in academic work. In the following we present some of them as reflection publications and the rest as they are presented in publications in the curricula websites.

The Department of Information Technology in University of Turku offers an interdisciplinary unit “Lean Software Startup” (Järvi, Taajamaa & Hyrynsalmi, 2015) for information technology and economics students. The unit is based on the lean startup method (Ries, 2011) and it aims to give to the students a “real-life” experience on the different phases of starting a startup, from the idea formation till the pitch. The unit provides students with knowledge and skills in software business, entrepreneurship, teamwork and the lean startup method.

Pilskalns (2009) reports how an entrepreneurial approach can be incorporated into a capstone project unit in the School of Engineering and Computer Science at Washington State University, and as a result the student engagement is increased. Furthermore, a case of a successful project is reported that attracted venture capital after the completion of the unit. It is interesting to note that out of the 200 papers that were reviewed in a survey about capstone projects (Drugan, 2011) only the paper by Pilskalns (2009) suggests the integration of an entrepreneurial approach to the capstone project unit.

Cornell Tech University offers two units<sup>2</sup> related to startup companies in their MSc in Computer Science. One of them focuses on technical aspects: the “Startup Systems Design and Engineering” unit introduces students to tools, techniques and best practices for the rapid development of prototypes and the facilitation of the deployment of applications, while the second unit, “Startup Ideas”, that focuses more on the enterprise and entrepreneurship aspects of startups, consists of conversations of students with guest practitioners, such as entrepreneurs, intrapreneurs, engineers, designers, lawyers and others. Groups of students prepare questions and topics to be discussed.

Stanford University offers several units about startups. Some of them, such as the “CS183B: How to Start a Startup”<sup>3</sup>, offer a series of seminars from invited speakers providing practical advice on topics such as: having ideas, getting users, company culture, fundraising, hiring, and more. Others, as for example the “CS183F: Startup School: The First 100 Days”, aim to teach the fundamentals of starting a startup, from the first days of ideas up to the execution. Lectures are again taught by invited experts and entrepreneurs.

## 3. Enhancing Entrepreneurial Skills in CS curriculum

The undergraduate Computer Science curriculum at the International Faculty of the University of Sheffield includes two units that aim to cultivate students’ enterprise and entrepreneurship skills. The first one is called “Industrial Software Project” (from now on called the Capstone unit) and the second one is called “Innovation & Entrepreneurship in IT” (from now on called the Entrepreneurship unit). Both units

<sup>2</sup>Cornell Tech, Curriculum, Master in CS, <https://tech.cornell.edu/programs/masters-programs/master-in-computer-science/curriculum-computer-science>

<sup>3</sup>Stanford University, CS183B: How to Start a Startup, <https://explorecourses.stanford.edu/search?q=CS183&view=catalog&page=0&filter-coursestatus-Active=on&collapse=&academicYear=20142015>

are offered in the final year of studies (one in each semester) as they require higher level of cognitive skills and a strong foundation of knowledge of the Computer Science field. In this section, we briefly present these two units and we propose how they can be integrated in order to further enhance the students' experience and improve their entrepreneurial skills.

### 3.1. The “Industrial Software Project” unit

The Capstone unit constitutes the main project-based capstone unit of the BSc programme in which external clients are involved. In this unit, students have to design and develop complete software solutions for external clients who come from the industry sectors of Telecommunications, Software Development and Banking. In the last two years, driven by our institution's commitment to social responsibility, focus has been shifted to having non-profit charity organizations as clients in order to support them with innovative software and IT services. Examples of projects and clients can be found at INVENT's website<sup>4</sup>.

At the beginning of the unit, students are divided into teams of 4 to 5 persons. Each team is then assigned to work on a project for the duration of the whole academic semester (15 weeks). The first session of the unit includes kick-off meetings with the clients who present details of the projects and the desired software solutions. Students follow an iterative development process for the development of the software. The details of the software development plan are set by the instructor who plays the role of a manager and determines iteration deadlines and required deliverables. Throughout the duration of the project, students are required to record all effort through an online project management tool. At the end of each iteration students receive detailed formative feedback from the instructor regarding their performance and progress. Finally, when the projects are completed at the end of the semester, students demonstrate the final software products to the clients.

### 3.2. The “Innovation & Entrepreneurship in IT” unit

Creativity, innovation and entrepreneurial skills are considered extremely important in the modern business environment since they can lead to new products/services which are the lifeblood of successful organizations. The IT sector offers a fertile environment for entrepreneurial endeavours capitalizing on the innovative features and the rapid technological developments in the global economy. Computer science students should take advantage of their technical and scientific capabilities and be skillful in innovating through technology. The focus of this unit is to build management, creativity, innovation and entrepreneurial skills among the computer science students, having as basic exercise the new product development process. It is considered an operationally focused unit, as it aims to develop the interdisciplinary skills required for successful product development in today's competitive marketplace.

The assessment of the unit is based on a team assignment. The assignment is an exercise of creating a new company based on an innovative IT-related product or service. Each team of students acts as a team of potential entrepreneurs, building in a stepwise approach a business plan and presenting a blueprint of the potential enterprise to a third party financing audience. The assignment involves the creation of a business concept that addresses a problem/issue in a specific sector/domain (e.g. health, education, transportation) by introducing a new product/service. This new product/service has to be under the broad area of ICT and it can include software, hardware or both.

The execution of the assignment is divided into two stages. During the first stage, every team conducts the “idea generation” and “idea screening” parts of the new product development process. This stage involves several group brainstorming and screening sessions which leads to an idea for an innovative IT-related product or service. During the second stage, the “Business Plan” is developed. Indicative important sections of the Business Plan are the following: Industry and Market analysis, Marketing strategy, Operations plan, Organization plan, and Financial Analysis. The final part of the assessment includes a pitch presentation in which each team gives a presentation to a panel of industry experts and potential investors.

### 3.3. Proposal: Integrating the two units

The Entrepreneurship unit manages in delivering most of the necessary knowledge and skills to students for the initial steps in starting up a company. However, the idea students develop is never transformed to a minimum viable product or even a prototype. The development of a prototype and its use by actual users in order to get feedback and attract them as customers increases the chances of funding since it convinces investors that customers are willing to buy the new product (Cusumano, 2013). The Capstone unit could offer to students the opportunity to develop working prototypes and to go through

<sup>4</sup><http://invent.citycollege.sheffield.eu/> (This is the web site where Capstone unit projects are presented).

several iterations of customer feedback in order to bring to the pitch presentation a working product of their software idea.

The integration of these two units certainly requires a number of issues to be considered. Concerning the Entrepreneurship unit, the most important change is to require from students to propose ideas that are only in the area of software products or services; the product should not have any hardware parts. The reason is that only such ideas can actually be implemented in the Capstone unit. Fortunately, the majority of the ideas proposed by students are software products and rarely involve some hardware component. Concerning the Capstone unit, the change that is required is a stronger focus on software development practices that are encountered in startup prototype development. According to the results of a systematic mapping study (Paternoster, Giardino, Unterkalmsteiner, Gorschek, & Abrahamsson, 2014) the most viable development processes for startups are agile methods. Since the product is obtained by frequent iterations and updated after customer feedback, processes in startups are evolutionary in nature. Requirements are usually identified as user stories. Popular frameworks, existing components and third-party open source code are frequently used to provide architectural design and implementation solutions. Concerning quality assurance, startups mainly focus on customer acceptance tests and frequently adopt automated testing when it is easily accessible. All these components and practices should be covered at the beginning of the Capstone unit. Some training sessions have to be planned early in the semester in order to familiarise students with these practices.

Another important issue relates with how the units will be delivered. Although a possible solution would be to have the Entrepreneurship unit in the fall semester and the Capstone unit in the spring semester, we suggest that a tighter integration of the two units is required. Therefore, we propose their integration in a year-long unit (spanning two academic semesters). This will allow the interweaving of the development of the prototype into the phases of the business concept development as it can be observed in the following suggested stages:

- Idea generation/Idea Screening and group formation (ENT)
- Concept development: Identification of functionalities and benefits (ENT)
- Customer/Competitor/Industry analysis: Identification of customer profile, product viability (ENT)
- Development of a User Interface Prototype: Feedback from a focus group of clients, prioritization of requirements (CAP)
- Evolutionary development of a Minimum Viable Product: A minimum of three evolutionary iterations with feedback from potential customers (CAP)
- Marketing strategy: Promotion/Distribution/Pricing (ENT)
- Financial Analysis: Cash flow (ENT)
- Organisation plan: Description of the strengths of the management team (ENT)
- Pitch presentation: Demonstration to a panel of experts and potential investors (ENT, CAP)

In the above listing, each of the stages has been tagged with the unit in which it currently belongs to (ENT for Entrepreneurship unit, CAP for Capstone unit). It is clear that it would not be possible to have one unit following the other.

The challenges in integrating the two units are the following: A year-long unit requires constant dedication from the students, as well as, proper management and coordination of all the activities and stages from the lecturers. The formation of the teams is also a critical issue in order to ensure that team collaboration will be smooth throughout the year. In addition, there might be cases that students will be reluctant to reveal a really innovative idea and might prefer to keep it for themselves as something to pursue after graduation. In certain cases, intellectual property issues might also need to be addressed. Furthermore, the feasibility of the idea needs to be carefully examined so that it is possible to develop a minimum viable product within the duration of an academic semester; students must restrict themselves to ideas that are “doable” within the unit. A final challenge can be that although students could have a really innovative and valuable idea for an innovative product or service, they may be skeptical to propose it intimidated by the complexity of its implementation.

The benefits of the integration of the two units can be viewed from three perspectives:

*Student engagement.* The conception of the projects by the students themselves results in an increased sense of ownership. Students get to develop their own idea and decide the technologies that they are going to use and are not constrained by clients’ requirements. This may have as an outcome much stronger motivation and engagement. Finally, it is generally accepted that students who are very oriented towards coding and software development are less interested in theoretical parts of units including business and entrepreneurship. Such an integration will engage also this type of students.

*Knowledge and skills.* Students will get a complete picture of all the phases that a startup company follows including the agile development of a product. Furthermore, students will get to use

contemporary frameworks, open source third party code and become acquainted with agile development practices.

*Future Potential.* The development of an actual product might also generate a larger incentive to actually attempt to launch the product after the completion of their studies. In addition, since a tangible product will exist, the chances of getting actual funding are increased.

#### 4. Conclusions

The Computer Science BSc curriculum of the International Faculty of TUoS includes in the 3<sup>rd</sup> level two units that aim to increase students' enterprise and entrepreneurial skills: the "Industrial Software Project" unit and the "Innovation and Entrepreneurship in IT" unit. The former unit aims to prepare students for their professional career as software developers, working in teams, and developing software for external clients. The latter unit aims to cultivate students' entrepreneurial skills and to equip them with the fundamental knowledge of starting a new company. This paper proposes the integration of the two units in one year-long unit with the principal goal to further enhance the aforementioned skills and knowledge and to better prepare students for working in or for creating their own startup company. The paper presents the challenges as well as the benefits involved in this integration. The benefits are summarised as increased student engagement, increased knowledge and skills acquisition and great potential for a successful startup after graduation.

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## CRITICAL MEDIA LITERACY IN COMMUNICATION SPACE OF HISTORICAL FILM EXHIBITION

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### Abstract

The film medium represents a rarely used source of inspirational impulses for the practical implementation of constructivist learning. Of particular promise is using its dispositions (representative relation to reality, the constructed nature of film images, and meaning-making character) and social scope as the starting point for specific communication within the participative space of a museum exposition. The current approach to the presentation of the medium and its history in film museums lacks a critical perspective and for that reason the educational potential of these institutions is highly limited. While film museums and exhibitions remain out of touch with the current needs of film education they have little to no influence on the development of critical media literacy.

NaFiM, a project initiated by students of the Film Studies Department at Charles University, Prague, aims to create original curatorial approaches to exhibiting the history of the film medium, combining exhibition design with education.

Organized exhibitions function as labs in which are tested possibilities of interaction, activity, association and multi-layered communication with the feedback of various groups of visitors. Currently, systematic methods of constructive communication in historical film expositions are developing within the project. The goal is more strategically use the communicative and constructive aspects of the film medium to curate the overall visitor experience.

Basing the museum's narrative of Czechoslovak modern history not on the authority of historical canon, but rather on the logic and structure of acquiring media literacy, enables the instigation of historically contextualized critical thinking making the visitor a participant of historical reflection. Working from the perspective of reality filtered through the construct of film (applying the codes, conventions and intentional approaches to the medium) we find is a suitable way to understand how particular eras represented themselves.

Thus the visitor is encouraged to learn how to read and perceive history through its images and reflections thanks to the communication allowed through the roles of film as a source which exceeds the conventional use of historical illustration and can be a more encrypted (but paradoxically more immediate) testimony of the era itself.

**Keywords:** *Media Literacy, critical thinking, film education, museum education, modern history.*

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### 1. Film exposition as a educational construction

While at the present time almost every country with a significant cinematic tradition has its own film museum, this type of institution – if we focus on the expositions themselves without considering supporting activities such as accompanying education programs – has not kept up with the current trends within film education.

Most prominent film museums settle for an overview of technological development and a presentation of thematically framed exhibits with attractive installation design rather emphasising mutual connections (whether they be through a historical context or narrational). The effect is a fragmented experience of the distracted visitor. The first reason for this omission is their uncritical approach to the medium, basing their view of film history on a fetishist concern for the iconic and for the nostalgic aura of the cinematography as a „dream factory“. The second reason is that expositions lack a formative approach to the visitor's cognitive experience and communication, despite limited hints of interaction, is one-way and closed.

However film as a medium, which has through its history taken various communication roles, can itself enrich the actual efforts to engage museum visitors, particularly if the cinema is approached as the complex social phenomenon it is.

The Project NaFILM was initiated by film studies students from Charles University in Prague with the aim to test new curatorial attitudes applicable in film museums and to develop the conception that would make the film museum a functional part of informal film education. We don't see the pedagogical role of the museum as something that goes beyond the presentation in exposition (guided tours, workshops, games in museum). On contrary we approached this role as an integral part of the communication effect of exposition – as a strategical guiding of attention and forming of the overall experience. Two realized exhibitions presented several topics from the history of Czech and worldwide cinema. Each of them was clearly bounded by a predetermined trajectory of the visitor's movement and by a sequential forming of their cognition. These „mininarratives“ with an authoritative structure of experience are based on the pedagogical theory of constructivism (a cognition is created by degrees through subsequent impulses). This authoritativeness is balanced by the conception of individual stations as interactive installations which were developed in cooperation with students from artistic field.

## 2. Examples of constructive communication

An example of the educational dimension of the presentation itself is the topic of pre-war Czech film avant-garde. Due to the main target group (high school students) it was necessary to make this theme accessible through comprehensible condensation to limit intellectual overload. The Czech film avant-garde found inspiration in French theories of „photogénie“ (that film purity is based on the ingenious harmony of the light and shadows) and its specific motifs originated in the enchantment with the modern world, in which life itself was transformed into a poetry of train expresses, transoceanic journeys or big cities illuminated by neon. The first installation used a stage design technique which enabled the visitor to conduct a miniature express themselves, exploring through the play of shadow images poetical motifs that were crucial for avant-garde artists.

In the following installation the visitor could build on previously uncsciously gained knowledge about avant-garde iconography. Situated in an isolated private space, they listen to film libretos of avant-garde poets and at the same time directs their „inner screen“ stories using visual motifs of the previous installation. Libretos were intentionally written as a succession of visual evocations – the installation thus functions as lessons from the imagination and the ability to perceive images in associations, so the experience-educational dimension is supported by this unusual way of reception.

The theme of avant-garde ends in a cinema space with a programme of Czech films, whose dramaturgy guides the visitor so that he can understand the already experienced principle of the avant-garde way of thinking: the seeking of a new and more penetrating vision of the world that was also the drive of early educational movies (e. g. *The Magic Eye*<sup>1</sup> wittily depicting the course of a weekday through microscopic lens).

The other curatorial principle was tested on an exposition of film pre-history. This topic isn't designed as the classical overview of technological preconditions, its motif is represented by the illusion of motion (whose basic principles are demonstrated on a specially designed multifunctional 3d zoetrope) and the train – the symbol of the modern era and the first „film star“ as well. This way the contextual background and implicit connections are employed in the exhibition – the train was an essential source of visual energy for the imperfect invention of cinema and thanks to its moving images became an exciting attraction.

The position of early projections in the context of fairground experiences is presented through the incorporation of new technologies. A film lecturer materialized by a 3D hologram accompanies early films with shocking themes (e. g. an approaching train) and intensifies the suspense of the public as replicating a common practice in early cinemas. VR goggles enable visitors to experience one of the first simulations linking movies shot from locomotives with the physically illusive setting of fake train carriages.<sup>2</sup> The train provides also the symbolic end of the exposition through a collage of famous railway scenes shot by avant-garde filmmakers in the 1920s. They returned to this motif to demonstrate that the dynamical film rhythm already had overcome the power of the steam engine. This simple condensation helps visitors to comprehend at first sight the development of the film language that the earliest films lacked.

<sup>1</sup>The Magic Eye (*Divotvorné oko*), 1939, director: Jiří Lehevec.

<sup>2</sup>This ancestor of contemporary virtual reality was called Hale's tours of the world. The tranhistorical use of VR goggles is based on reconstruction of this popular attraction from beginnings of the 20th century.

### 3. Critical thinking and history reflection(s)

The communication concepts presented were created rather intuitively without any methodical framework. But now the aims of the project have entered into the phase of methodical revision and the new ways of communication based on dispositions of the film medium are being explored. Their use within the communication interface has the potential to motivate the interactive-experiential mode as a higher form of activity – critical thinking. A film museum whose narrative is based not on the authoritative exposition of history but on the logic of acquiring critical media literacy would be, especially in the Czech context, a significant support for strongly transmissive high-school teaching which affects mainly the subject of modern history.

The cinema as a social phenomenon can serve as a formable device mirroring the last century and in the museum its role needn't be limited to a mere illustration of historical events. Film can function as a narrative filter if the representative relation of film to reality and the simulation of its changing communication roles could be utilized. Czechoslovak history offers many of them: cinema helps to reinforce ideologically the identity of the new and artificially created state (1920-30s), serves the needs of totalitarian regimes and its explicit (1950s) and implicit (1970-80s) social engineering, and participates in political liberalization and revision (1960s).

The key to our communication approach is to let history itself become a narrator – through its own depictions of specific periods, intentional or unwitting. The visitor can then be encouraged to look behind this filter in open confrontation of these images with their own constructive nature (based on codes and conventions) and competing representations. The problem of objective view of history and how to approach it through representations and constructs brings meta-narrative dimension into the story of 20<sup>th</sup> century, that is the most appropriate starting point for engagement of the visitor.

This way three educational functions are fulfilled: to provide in a constructive way an awareness about film history as primarily social phenomena, to enable visitors to discover the mediating and meaning-making role of the medium (critical thinking in historical connections) and, finally, to allow a transformation, in which historical presentation changes to historical reflection thanks to the facilitative work of museum communication.

The communication interface using all three functions is presently developing in the interdisciplinary realm of film studies and history didactics. As a prototype of communicational schema the period of Stalinism was chosen because of the ideologically explicit and socially appellative function of the cinema and socialist realism codes. The case study will be accessible in text and virtual form next year at websites of the project NaFILM.

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The Magic Eye (Divotvorné oko), 1939, director: Jiří Lehovec.

This ancestor of contemporary virtual reality was called Hale's tours of the world. The tranhistorical use of VR goggles is based on reconstruction of this popular attraction from beginnings of the 20th century. Hayes, Ch. (2009). Phantom carriages: Reconstructing Hale's Tours and the virtual travel experience. *Early Popular visual culture*, 7, 185–198.

# STUDENT TEACHERS APPROACH ON USING INDIGENOUS LANGUAGES AS LOLT IN TEACHING SCIENCE IN PRIMARY SCHOOLS

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## Abstract

The study sought to explore the approach of student teachers towards using indigenous languages as Language of Learning and Teaching (LOLT) of Science Subjects in primary schools of Motheo district in South Africa. The aim was to compare the approach and attitude of 20 student teachers towards the use of English as Language of Learning and Teaching (LOLT) and that of *Sesotho* as Language of Learning and Teaching (LOLT) of Mathematics to Grade 4 classes and to examine the students' approach towards the use of mother tongue instruction in the teaching and learning of Mathematics in South African primary schools. A practical teaching experiment was conducted to investigate the feasibility of using *Sesotho* as Language of Learning and Teaching (LOLT) of Mathematics to Grade 4 class and investigate the student teachers' approach in the teaching situation. In addition a descriptive survey research design which used questionnaires and interviews as data collection methods was also employed for its usefulness in exploratory studies. Data gathered was subjected to both quantitative and qualitative analysis resulting in data triangulation for validation. The results show a positive approach towards the use of *Sesotho* as Language of Learning and Teaching. The implications and recommendations were also discussed.

**Keywords:** *Language of Learning and Teaching, Language policy, language attitudes.*

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## 1. Introduction

In South Africa, parents are permitted to choose the language in which their children are to be educated (Department of Education 2002); but the majority of parents demand that their children are educated in English (Heugh 2010). This is partly due to global prestige of English as a medium of international communication, language of business, and pre-requisite for employment (Bhoi 2014).

English is the medium of instruction in primary, secondary and tertiary education. Indigenous African languages such as *Sesotho*, received very little attention in terms of use as media of instruction. The continued use of English as a medium of instruction in teaching Mathematics means that no scientific ideas can be formulated using *Sesotho* in the present schooling system leading to perpetual scientific bankruptcy (Phindane 2015: 107).

The mother tongue is a production tool that facilitates thinking and sharing of ideas in a teaching and learning situation. Studies have shown that instruction in the mother tongue is beneficial to language competence in the first language, achievement in other subject areas and training in a second language (UNESCO 2016). According to Beka (2016:17) "instruction in the mother tongue helps in the search for self-affirmation, establishes group identity, satisfies the rational urge for cultural footedness and avoids fanatics in concept formation, critical thinking, creativity and in important social values". In other words, children who begin their education in mother tongue make a better start, demonstrate increased self-confidence and continue to perform better than those who start school in a foreign language. This is supported by the 1951 UNESCO resolution which asserts that the best medium for teaching a child is the child's mother tongue. The researchers undertook this study in order to examine the attitudes of students in tertiary institutions on the use of *Sesotho* (mother tongue) as a medium of instruction in the teaching and learning of Mathematics in primary schools.

In their study on the effectiveness of teaching and learning mathematics using children's Home language and cultural tools, Hafiz and Farik (2016) observed that children who were taught without using their home language and materials from their cultural environment, did not perform well. They concluded by saying that the poor performance of learners in mathematics primary school is due to the negligence of incorporating children's home language and material from children's cultural environment.

Researchers such as Ndamba in Phindane (2015) established that learning takes longer in a foreign language (English) than in the mother tongue (*Sesotho*). This means that mother-tongue tuition ensures linguistic accessibility to studied material, helps to develop critical thinking and to foster effective communication. According to Mufanechiya and Mufanechiya (2011:195) mother tongue instruction results in improved learning achievements, better adjustments to school, cultural preservation and self-confidence in children. With the above discussed characteristics of mother tongue instruction one wonders why South Africa, after twenty three years post-apartheid, is not considering indigenous languages such as *Sesotho* to be used as media of instruction in the teaching and learning of subjects in primary schools and why students in tertiary education develop negative attitudes towards the use of *Sesotho* as medium of instruction in Mathematics.

South African learners who were interviewed by Setati (2005) and Langa and Setati (2006) preferred the use of English in the learning of mathematics in the secondary school. These researchers attributed learner choice of the language of instruction to the socio political situation. These learners did not see value in their African languages as they do not have any social and economic benefits. In September 2009, the Minister of Higher Education, Blade Nzimande said that those taking up African languages at University level were sometimes perceived by their peers as ‘second-grade students’ (Sapa 2009). These are few examples of learners’ attitudes towards English as a medium of instruction.

Learner attitudes can also be explained in terms of influence from teachers. When teachers undermine the children’s L1 and use English as the language of learning and teaching (LOLT) from the first grade, this may result in children having a negative attitude towards their mother tongue (*Sesotho*) being used as the language of learning and teaching (LOLT) Mathematics at primary school level

## 2. Purpose of the study

This study is therefore an attempt to explore the possibilities of using *Sesotho* as a language of learning and teaching of Mathematics to a Grade 4 class and investigate the attitudes of student teachers towards the use of *Sesotho* as a Language of learning and teaching (LOLT) Mathematics as a science subject.

## 3. Research questions

This research endeavours to address the following questions:

- 1) What attitudes do student teachers have towards the use of *Sesotho* as LOLT in mathematics?
- 2) What implications may be deduced from the respondents’ collective attitudes towards *Sesotho* as LOLT of mathematics in the light of multilingualism policy of South Africa?

## 4. Methodology

### 4.1. Design

This study used a mix method design and both quantitative and qualitative approaches to obtain data. A mixed method is a procedure used to collect and analyse both quantitative and qualitative research to understand the problem identified in the study (Creswell 2008). The purpose of mixed methods in this study is to explore the problem that relate to both aspects of the approach and do so accurately. In order to measure the students’ language attitudes towards the use of *Sesotho* as a medium of instruction in the teaching of mathematics in schools, student teachers’ questionnaire based on the students’ experiences of learning mathematics using *Sesotho* as a medium of instruction in schools were administered to the teachers. In addition a practical teaching experiment was used to find out the feasibility of using indigenous languages as medium of instruction in the teaching of Mathematics to a Grade4 class.

### 4.2. Instrumentation

#### a) Practical teaching experiment

The practical teaching experiment was used in this study. In an experimental design “the investigator has some control over what will happen to the subjects by systematically imposing or withholding specified conditions. It is a procedure for investigating cause and effect relationships by randomly assigning subjects to groups in which one or more independent variables are manipulated. The intent of an experiment is to compare the effect of one condition on one group with the effect a different condition has on a second group, or to compare the effect of different conditions on the same group. This experimental design involves a pre-test and post-test comparison group approach in the practical teaching phase. In the pre-test and post-tests design groups for learners are given a pre-test then the practical teaching and then the post- test.

Ten mathematics student teachers ( Group A), doing their third and final year in teacher training at Central University of Technology, Free State were asked by the researcher to teach the same topic in Mathematics using *Sesotho* as a medium of instruction to Grade 4 pupils during their teaching practice session. Another group of ten student teachers (Group B), doing their third and final year in in teacher training at Central University of Technology, Free State , were asked by the researcher to teach the same topic in Mathematics as in Group A using English as a medium of instruction to Grade 4 pupils during their teaching practice session. In this study Grade 4 classes were sampled and used for practical teaching to test the feasibility of using Sesotho as LOLT of mathematics and also establish the attitudes of student teachers towards the use of Sesotho as a LOLT. The Grade 4 classes were used for the study because this is at the transitional level when learners switch from Sesotho to English as required by the Educational Act 2002. When sampling, the researcher conveniently drew representatives of Grade 4 classes from a large population of Grade 4 classes in primary schools as this saved time and expenses that would have been incurred if one had to study the whole population. The classes were of a mixed ability stream. The Grade 4 classes were rich in information such that the information from the experiment could be easily generalised to the entire population under research.

#### b) Questionnaires

Before the questionnaires were used a pilot study was carried out in Mangaung, Motheo district with 15 people to test whether the instrument is intelligible. The researcher carried out group administration of the questionnaires which had advantages of high response rate, shorter data collection time and gave the researcher a chance to verbally explain the purpose of the survey and answer any questions from the respondents. In this study the questionnaires were used to extract data that was embedded deep in student teachers concerning their attitudes, feelings or reactions towards the use of *Sesotho* as a LOLT of mathematics in primary schools. The questionnaire was administered to 20 Group A and Group B student teachers from Central University of Technology, Free State in Motheo district.

## 5. Research Findings

The success of using *Sesotho* as a medium of instruction in the teaching of Mathematics in primary schools depends on people's attitudes, approach and will to actually implement it. Language attitudes are best appreciated by closely examining their origin. An attitude is an organized predisposition to think, feel, perceive, and behave toward referent or cognitive object an enduring structure of beliefs that predisposes the individual to behave selectively toward attitude referent (Kosslyn and Rosenberg, 2006: 738). Attitudes take a positive or negative direction with very few cases being neutral (Kosslyn and Rosenberg, 2006). Since attitudes to language form a belief (in individuals) in relation to the referent object, their effect on language policy change cannot be taken for granted since they play an important role leading to either acceptance or perspective of the parents rejection of language policy change. It is imperative that language attitudes of users be taken into account before change in the language of instruction is affected.

There are several significant questions that asked of the respondent to provide answers which showed the student teacher's attitudes towards the use of *Sesotho* as medium of instruction in teaching Mathematics in primary schools. One of the questions from the questionnaire was: Which language of instruction is mostly likely to give primary school learners a clear understanding of mathematical concepts in a teaching learning situation in South Africa? The student teachers indicated on the questionnaire that English was the language of power and prestige in South Africa and that English is the official language of instruction in the education system of South Africa. Hence, English dominates other African languages as evidenced by the responses of the parents, learners, teachers and lecturers.

One of the reasons that these respondents opted for English was that one becomes globally marketable in industry and commerce. Such a view would not support the use of *Sesotho* as a language of instruction in teaching Mathematics. Views that English is more important than *Sesotho* have been passed on to children by parents who tell children that English is prestigious and provides educational and employment opportunities in the future (Phindane, 2015). The student teachers develop negative attitudes towards the indigenous languages which they regard as less important (Ndamba, 2008). This is supported by one of the student teachers who pointed out that, one of his Grade 4 pupils argued that "*Naa ho a thusa ho ithuta Mmetse ka Sesotho? Sesotho se tshwanetse ho ruta Sesotho, e seng disubject tse ding. Ho theola boleng ba rona. Ntate wa ka ha a e rate nthweno..*" (Does it help to learn Mathematics using *Sesotho*? *Sesotho* should be used to teach *Sesotho*, and no other subjects. It lowers our social status. My father does not like it.) Another significant question on attitudes from the Questionnaires was: What do you think is the attitude of South African towards mother tongue instruction in the teaching of Mathematics in primary schools?

The respondents to this question believed that most of the South African would prefer English as the medium of instruction in education. Most interviewees felt that English offers them better opportunities for employment compared to *Sesotho*. However, English was seen as empowering them to

compete well in the township. English guarantees them “access to the system and equal opportunity to participate in it” (Phindane, 2015: 107). As such, changing to indigenous languages such as *Sesotho* is viewed as a direct threat to their (respondents) perceived job opportunities, thus attracting negative attitudes. Those who could speak it received commendation and were made to feel that they were far better than those who could not speak it. For most Africans, English became synonymous with knowledge and education. Speaking good English was, wrongly of course, seen as an indicator that one was educated. English was thus, associated with good life and as such, attitudes towards it became favourable. Those unable to speak English were regarded as backward. This seems to emanate from the notion that a well “schoolled” child is one who is conversant and fluent in the English language. English is therefore, viewed as language for prosperity. Beka (2016) attribute the negative attitudes towards the use of African languages as languages of instruction in education, to the fact that the current language policy requires children to learn in the mother tongue only in the lower grades. This definitely impacts on students’ zeal to learn the subject and hence, they fail to perform well in *Sesotho* Matric examinations. As a result student teachers viewed English as a gateway to success and consider *Sesotho* as a language that is not economically viable.

This was demonstrated by one student teacher in this study who, with reference to the use of *Sesotho* as the language of instruction in Mathematics, says, “*Ke tjho jwalo hobane ke qalo e mpe. Ha bana ba fihla ditlhahlobong tsa Grade 12 ho tlo ba boima ho bona, ba qetelle ba pasitse disubjet tse ding empa e seng puo ya English.*” (I say so because that is a bad beginning. When children get to Grade 12 examinations it will be difficult for them, resulting in them passing other subjects but not English language).

The practical teaching experiment intended to have first-hand experience of teaching Mathematics using *Sesotho*, an indigenous language, as a LOLT. This provided answers to the feasibility of using *Sesotho* as LOLT of Mathematics to primary school children and establishes how the learners develop the concepts of Mathematics in *Sesotho*. Lack of teaching material for Mathematics written in *Sesotho* was a barrier in this study. Mathematical jargon and other important terms were borrowed or translated into *Sesotho* from English. Translation of mathematical terms from English to *Sesotho* enabled the Grade 4 learners to understand the concepts in their mother tongue. This is supported by Ranaweera cited in Brock-Utne who says: The transition from English to the national languages as LOLT in science helped to destroy the great barrier that existed between the science-educated elite and the non-science-educated masses, between science itself and people. It gave confidence to the common man that science is within his reach and to the teachers and pupils that knowledge of English need not necessarily be a requisite for learning science. The value of mother-tongue instruction is literally incontestable (Brock-Utne, 2000:153). The medium of instruction is viewed to have a strong bearing on how the learner adjusts to primary school life as it either provides a smooth handover-takeover from the home to the school system or a rough grab that might result in frustrating the learner. (Prah, 2005:26).

The teaching of the concepts of Addition and Subtraction (*Ho Kopanya le ho Tlosa*) involved the use of teaching aids like sticks and stones, and even playing games such as ‘*Morabaraba*’ to explain the concepts of counting and addition. The Grade 4 learners in Group A interacted freely through the use of their mother tongue. With regard to this, Nyota and Chikodzi (2010) noted that township learners use their everyday experience to illustrate mathematical concepts. The continued use of *Sesotho* as a medium of instruction in lessons of Group A facilitated their understanding as they could easily relate the concepts to their environment. The student teachers’ attitude towards the use of *Sesotho* as medium of instruction in the teaching of Mathematics affected the Grade 4 learners’ performance and participation. The student teachers felt that their parents did not want them to learn Mathematics using *Sesotho* as this would never help them in future. One of them said “*“Naa ho a thusa ho ithuta Mmetse ka Sesotho? Sesotho se tshwanetse ho ruta Sesotho, e seng disubject tse ding. Ho theola boleng ba rona. Ntate wa ka ha a e rate nthweno.*” (Does it help to learn Mathematics using *Sesotho*? *Sesotho* should be used to teach *Sesotho*, and no other subjects. It lowers our social status. My father does not like it.). The attitude that English is more important than *Sesotho* is passed on to children by parents who tell children that English provides educational and employment opportunities in the future (Phindane, 2015). All in all, the learners in Group

A showed an improvement on their performance after they had been taught using *Sesotho*, their mother tongue, as medium of instruction in learning Mathematics at Grade 4 level. Chivhanga and Sylod (2014) and Mutasa (2004) emphasize that mother tongue education ensures learners’ performance at the maximal ability and psychological support. Children who begin their education in mother tongue make a better start, demonstrate increased self – confidence and continue to perform better than those who start school in a foreign language. During the lessons some learners from backgrounds where English communication is non-existent had difficulties in communicating in English. This even forced the teacher to use their mother tongue (*Sesotho*) in giving illustrations, demonstrations and instructions for them to understand the mathematical concepts being taught. This change of media of instruction is even supported by Sepeng (2015) who argues that mother tongue instruction should be promoted to enhance concept formation and include a majority of the indigenous learners who grapple with English. According to Phindane (2015), the *Sesotho* learners use English from Grade 4 as the LOLT and one subject that they

perform badly in is Mathematics. One proof to this pathetic learning situation is that Mathematics teachers have been observed to code-switch a lot from English to *Sesotho* as they attend to their classes (Nyota and Chikodzi 2010). A language (*Sesotho*) that a child knows effectively should be the language of education and training. The use of mother tongue as a medium of instruction ensures that learners are taught in a language that they are familiar with, is useful in local and national life, can be related to their environment and experience of their day to day life. Beka (2016) asserts that in a learning situation where only the L2 is used as a medium of instruction, students face problems because the students have to make sense of the instructional tasks which are presented in the second language.

## 6. Conclusions

This research indicates strong evidence that parents, teachers/lecturers and college/university learners have a negative attitude towards the use of *Sesotho* as a LOLT of Mathematics. Results consistently show that the majority of respondents did not prefer the use of *Sesotho* as medium of instruction at primary school level. Most of the respondents preferred that English remain the only medium of instruction from primary up to university level and they felt that English offers them better opportunities for employment compared to ChiShona. English was seen as empowering them to compete well in the global village. English seems to guarantee them “access to the system and equal opportunity to participate in it” (Chivhanga and Sylod, 2014: 34).

Attitudes to indigenous languages as subjects on the curriculum are still negative in some educational institutions. The languages are seen as soft options or where their teaching is made compulsory, an unavoidable drudgery. Research has also shown that people think that English is more important than *Sesotho* and this has been passed on to children by parents who tell children that English is prestigious and provides educational and employment opportunities in the future, (Hafiz and Farik, 2016).

Contrary to the above negative view some of the student teachers interviewed in this study had positive attitudes towards the use of *Sesotho* as a medium of instruction in education. They believed that the use of mother tongue as a medium of instruction ensures that learners are taught in a language spoken by a large number of people, which is useful in local and national life and the language which is familiar to both learners and teachers. Some participants pointed out that indigenous languages could be used as tools of economic empowerment by conveying economic ideas because not all indigenous people are conversant in English. This is a positive attitude towards the use of indigenous languages as languages of instruction in schools.

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## **PERCEPTIONS OF MUSIC STUDENTS FOR EFFECTIVE GROUP WORKING**

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### **Abstract**

Several research studies have confirmed that students who participated in various types of small-group learning had greater academic achievement, learn more actively and effectively, exhibited more favorable attitudes towards learning, more satisfied with their education and had increased persistence. (Davis, 1993, Johnson et al., 2006). However it is also claimed that the use of team or group work at all levels of education, if it is not well managed, can backfire on the learning. This paper aimed to explore the perceptions of music students regarding group work. Metaphor and open ended questions have shown to be a useful tool to understand the perceptions. Majority of music students perceive group work as being together, building friendship, sharing ideas, workload and being powerful. On the other hand some students indicated although they are set as a grouped they work individually in group. Music students valued the group work for improving their musical skills, affective skills, and social interaction skills. Thirteen aspects were shown as a negative side of group work such as difficulties of time arrangement, evaluation, group composition, pressure and working environment.

**Keywords:** *Group working, Music students, Metaphor.*

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## THE TEACHER AS A QUALIFIED INTERLOCUTOR: EDUCATIONAL IMPLICATIONS, CONDITIONS AND OPPORTUNITIES

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### Abstract

The Bologna Process stimulated a reorganization in higher education field, which meant also a reflection about the teaching methods used by teachers. With this new academic reorganization of higher education, becomes relevant to question the teacher's role in the construction of learning by students.

The work presented here was developed in the research project called "The teacher as a qualified interlocutor: educational implications, conditions and opportunities." The main goal of this research project was focused on assessing the impact of a training program of one curricular unit in a class of 30 students of the 1st higher education cycle, where the teacher tried to take the role of qualified interlocutor, as opposed to either the instructor paper or the facilitator. Part of the argument is that the educational act is realized from the quality and relevance of the interactions that take place between teachers and pupils or students with each other.

Methodologically we used i) classroom observation; ii) analysis of support instruments used by the teacher in the classroom; iii) work done by students throughout the semester; iv) focus group conducted for students. The classroom observation was performed through the support of two scripts: one corresponding to the general dynamics of the class, but with higher incidence about the teacher's behavior during the class and another script related to student behavior analysis. The analysis of support instruments used by the teacher aimed to understand their quality and relevance for the training of students. Through the work done by students and the focus group we tried to understand the position of the students about the teaching options and the relevance of these for their construction of critical thinking about the topics covered in the classroom.

The findings allow argue that the production of learning by students does not mean focus all pedagogical act only on the student, but to develop quality interactions between teachers and students. In particular, the work done by students' currents shaping evolution of these critical thinking, achieved through relevant and located interventions by the teacher, thus assuming the role of qualified interlocutor.

**Keywords:** *Higher education, qualified interlocutor, critical thinking, teacher, Bologna Process.*

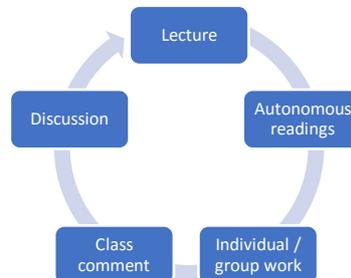
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### 1. Introduction

The main goal of this research project was focused on assessing the impact of a training program of one curricular unit in a class of 30 students of the 1st higher education cycle, where the teacher tried to take the role of qualified interlocutor, as opposed to either the instructor or the facilitator role. Part of the argument is that the educational act is realized from the quality and relevance of the interactions that take place between teachers and pupils or students with each other. The aim here is to understand how a teacher can be constituted as a qualified interlocutor in the teaching-learning process, through the pedagogical organization of classroom and classroom work. The aim here is to demystify the place of teachers, students and knowledge in the context of higher education, under the assumptions of the Bologna Process. It is our intention to argue that the role of the teacher cannot focus on a facilitator, but that he / she must adopt a mediating and challenging profile between him, the students and the knowledge, and cannot deny his educational influence.

The Curricular Unit presented itself as object of this investigation was included in the curricular plan of the Degree in Educational Sciences, concretely, of the second semester of the 2014-2015 school year. The group that participated in the investigation was composed of about 30 students. The objective was to understand the impact of a specific training program organized by teacher. The Figure 1 presents the pedagogical organization of the training program, with the various work moments that were developed during the semester in this Curricular Unit.

Figure 1. Pedagogical organization of classroom work.



The work's dynamics developed in this Curricular Unit were based on five components that are presented in Figure 1. All of them were developed and organized by teacher, perceiving a clear pedagogical intention. The moments addressed to the "Lecture" were stimulated by the teacher as a way of presenting and introducing to the class the contents that would be work in the Curricular Unit. Following this component, there was time for two types of autonomous work by the students: readings (the texts was selected by the teacher) about the contents of the subject under discussion, and individual or group work about the readings, both were supported by a script built by the teacher. The commentary classes were born from the analysis carried out by the teacher about the written works developed by the students, where he emphasized the ambiguities and conceptual tensions demonstrated by the students to construct a space of discussion. The moments of discussion were gaining relevance following the previous stages, with the teacher seeking to develop the skills that would allow the students to participate in an informed and supported way.

This cycle work was developed in two moments that corresponded to two central themes of this Curricular Unit: (i) School education and processes of educational influence; (ii) Pedagogical relationship.

The organization and management of the pedagogical work of this Curricular Unit are the object for the reflection and discussion about the status of students, the status of knowledge and the status of the teacher as a qualified interlocutor within the framework of the communication paradigm.

## 2. Theoretical problem

The Bologna Declaration stimulated in the field of Higher Education a reorganization in this level of education which also meant an influence on reflection about teaching methods and student learning. With this new pedagogical mandate of reorganization of Higher Education, becomes pertinent and necessary,

“(…) To address and reflect about the role and action of teachers in higher education as a task which not only seeks to confront perspectives but also to explicit and ask about concepts and, at the same time, to try to highlight the expectations and some of the mistakes that in this case, have been built around the pedagogical interventions by teachers” (Trindade, 2010:82).

The role of the teacher begins to be questioned in the light of the Bologna Declaration's about demands for new approaches to teaching and learning (Ramos et al., 2012). It is understood in this organization of Higher Education as a refusal of a prescriptive educational act as a constant recourse a teaching methodologies that are characterized by their standardized, systematic and are mainly polarized in the contents to be learned (Trindade, 2010). We could observe a refusal of the instruction paradigm (Trindade & Cosme, 2010), that through the pedagogical triangle proposed by Houssaye (Houssaye cit in Trindade & Cosme, 2010) presents the act of learning limited to the act of teaching. In this paradigm, the relation between teachers and cultural heritage occupies a privileged place, leaving to the students the place of the dead for the "appropriation of an object knowledge" (Charlot cit in Trindade, 2010). We assumed the intention to construct a pedagogical program that is the opposite of the old practices by the

faculty, in which even after the Bologna Process “in the case of teaching staff, the classroom remains the privileged territory of action – where the knowledge is to be transmitted and the books continue to be the major support for students in the field” (Ramos et al., 2012:80).

Therefore, if the Bologna Declaration seeks to distance itself from the instructional paradigm (Trindade & Cosme, 2010), it is understood through the documents and speeches of this Declaration an approximation of what we can call the paradigm of learning (Trindade & Cosme, 2010), that understands students as protagonists and as the center of school education projects “the metaphor gave substance to the principle of shifting pedagogies from teacher-centered to student-centered” (Colet, 2016:8). In this paradigm students are perceived as having coherent theories about the world like “culturally self-sufficient” Cosme & Trindade, 2013:44), in which they can acquire greater coherence and pertinence as they are discussed and shared with others. In this paradigm, the teachers’ role is limited to promote “the development of subjective exchanges” (Bruner cit in Trindade, 2010). It seeks to access the interpretation and understanding of the real rather than to access the perfection of factual knowledge (*ibidem*). The vulnerability observed in this paradigm is centered on the fact that cultural heritage is not explicitly object of valorization and interpellation:

“(…)The fact that the status of the cultural heritage, which is one of the main factors justifying the existence of the school, is not object of appreciation and explicit interpellation, even though it is referred to as a variable to be taken into account, even if in an abstract and undifferentiated way (...) the particularities of learners are thus taken into account, but the epistemological and conceptual peculiarities of information and study objects are not explicitly and crucially valued, which is the reference of the work of student’s learning” (Trindade, 2010:85).

There are some misunderstandings at the level of the concepts of pedagogical intentions that exist in the structuring discourses of the Bologna Declaration and that must do with:

“The status attributed to students as educational actors, with the status attributed to cultural heritage as an object of unavoidable appropriation in the middle of any formative process that may occur in the most diverse types of formal educational contexts, and finally, with the which is the responsibility of teachers to take this” (Trindade, 2010:87).

Trindade (2010) argues that, also, in Higher Education it is necessary to think about the act of teaching and learning from what it calls a pedagogical paradigm of communication, where neither students, or knowledge, or teachers can be referred to the place of the dead and where relations of a more plural, contingent and random nature are developed between the three corners of Houssaye’s pedagogical triangle (cit in Trindade, 2010). According to Trindade (2010) is the communication, not learning, that can be assumed as an alternative to the act of instructing. Arguing that the educational act is concretized based on the quality and relevance of the interactions that are established between teachers and students or students and teachers among themselves. In this paradigm, the teachers cannot deny that they have educational influence, and that this is not synonymous of teachers being forced to adopt a normative cultural action to disseminate information, procedures, conceptual tools and attitudes that do not admit of interpellations.

### 3. Methods

At the methodological level, we chose a qualitative methodology and we recognize the relevance of class observation as a conducive device for the professional development of the teacher, based on the presupposition of reflection on action and about the action. In the present case, the observation of classes was based on the interest and motivation to perceive in what way the teacher fit the pedagogical paradigm of communication as opposed to the pedagogical paradigm of instruction or learning.

The observation of classes took place in the Curricular Unit Psychology of Learning that falls in the 2nd Semester of the 1st Cycle in Educational Sciences in the Faculty of Psychology and Educational Sciences in the academic year 2014/2015. All classes of this Curricular Unit were object of observation, being between the month of February to the month of June of 2015. A total of six classes were observed.

In the classes, which were observed we used two types of observation grids: one directed to the observation of the teacher’s performance and another one to register the behavior of the students.

The observation grids directed to the teacher was composed of two general areas: i) communication process; (ii) organization of the discussions. These general areas covered issues such as the organization and relevance of the teaching materials used in the classroom and teacher management of

the moments of discussion in the classroom. The observation grid directed to the students was composed of two general areas: i) behavior throughout the class; ii) participation in the moments of discussion.

To deepen the relevance of this pedagogical model for the students, a *Focus Group* was carried out with a group of 6 volunteer students (five female and one male), and as Quivy & Campenhout (2008) tell us, the purpose of this instrument was to analyze the impact of an event or a precise experience on those who participated in it, in this case, to perceive the impact of this training model on the students who have experienced it. Therefore, a set of predefined questions was not used, but rather a script with topics related to the subject being studied. The topics that compose the script were: communication process; Exhibition materials; Organization of debates; Model of classroom organization. Content analysis was carried out, where the following categories were constructed: commentary classes; Role of the teacher; negative points; strengths; Teaching materials.

#### 4. Results and Discussion

The results presented here will be primarily based on the importance that the students recognize in this pedagogical work organization in the classroom promoted by the teacher. For students, the different moments of work favored in-depth reflection about certain topics, namely, autonomous readings' moments combined with discussion and group's work "we read the text and then there are doubts, but then we have a moment of group discussion, in that, most of these doubts are already resolved and if they are not resolved we have this individual service in which the fear of asking is reduced because we are in a group "(Participant B). We really see the value of individual/group work as moments of learning consolidation "I think that work forces us to try to understand the text, because maybe if I did not have the work, I had the text we read very superficially without try to understand some important points, but have a work and not be a work without direction, have a script, which already demonstrates what is important ... "(Participant C). In fact, all the works produced by the students were accompanied by a script previously constructed by the teacher, as a reflective tool for the work that the student would have to carry out, belonging to the teacher an important role to support the students' learning even when they take place in autonomous moments. The scripts are presented as mediators to support the students' work, and their use "corresponds to an exercise of educational influence which it shown that the teachers' protagonism does not have to inhibit the students' protagonism" (Cosme & Trindade, 2013:97).

All the works done by the students were object of comments by the teacher, namely, in highlighting the epistemological misconceptions presented in the reflection. These comments were returned to the students in a timely manner, meaning that all students had the opportunity to reshape their work considering the comments of the teacher, which is also highly valued by the students "another important thing is that with this teacher, he helps us to build the texts and for example, even at the level of writing, no teacher ever calls us «look if you wrote otherwise I even realized your sense but you should have explained better, go more to the center of the issue » but they do not tell us that, so we get the work back with the grade but we do not know what I had wrong, and with this teacher we know and help us immensely ... " (Participant A). Analyzing the works that were produced by the students during the semester, and the classification obtained by them, it is possible to observe a positive evolution in the level of scientific writing, as well as the student's appropriation of the concepts and problems of the Curricular Unit.

Through the observation of classes was possible to see that the teacher used the expository method, using PowerPoint. Considering the results of the observation grids, this instrument is a way of organizing the exhibition and presenting comments, not as a moment of knowledge transmission. This method stands out in the sense that it has a clear pedagogical intention: clarification of concepts and mistakes demonstrated by students in the works presented. In fact, the commentary classes, carried out by the teacher, were planned and constructed considering the difficulties presented by the students in the works carried out, namely, constraints and misconceptions at the conceptual level "(...) we are all different and in another year people are different, the problems are different and in the fact, he does it per our difficulties is very important "(Participant B). This fact is also acknowledged by the students "It is possible noted that he personalizes [the powerpoint] per each class, per each need" (Participant C). This same form of work brings new possibilities of learning, which is valued by the students "sometimes he highlights some things that we do not perceive, are things he talked about in class and we realized that were things that we did not understand, that we did not talked at work, which we confused, so I go back to the powerpoints, at least not to make the same mistake in the following works. Therefore, powerpoint is a resource for not making the same mistake again in other works. "(Participant D) "this expository lesson serves to clarify some issues that we sometimes do not even realize we did not understand and when he speaks, when he exposes we realized that we had not even thought about that. "(Participant A).

The pedagogical organization of all the work carried out in the classroom presents indicators that distract the teacher from the instructional paradigm, in the sense that all moments of work, individually and in groups, demonstrate a clear pedagogical intention, where rather than a situation of pedagogical facilitation, we have work of qualified dialogue (Cosme, 2009). This organization is built through the highlighted of the communication process between students and the common cultural heritage, in this case constructed through the pedagogical organization around differentiated works, and where the discussion between all the involved is valued by the students with their relevance to the construction of knowledge "knowledge is being built, for example, there are things I'm picking up, I did the work and then he's talking in class ... I think these three moments, the individual readings, the work that guides the readings, the group discussion and the class with him clarifying, are essential, because if he stopped at work, even with the teacher's comments, it would not be enough." (Participant A).

Based on this situation, we can affirm that we are faced with a teacher who assumes the role of qualified interlocutor, where the qualified interlocution action is based on four didactic axes: "(i) situations of direct support to students' learning; (ii) support situations for students' autonomous work; (iii) the organization of work and learning situations; (iv) the situations of support and encouragement to students' reflection" (Trindade, 2010). We can see a clear departure from the paradigm of instruction, even in the aspect that could bring them closer: the lectures, since the differentiating factor of these centers on its clear pedagogical intention in the communication paradigm, where expository classes are used "as instruments of pedagogical action, under a type of educational intentionality that obliges teachers to use them more limited and contextualized." (Trindade & Cosme, 2010: 87) and ceasing to be the only strategy to put students in contact with the cultural heritage. In the same way, the role of the teacher moves away from the role of facilitator since it did not occupy a passive place in the process of construction of learning by the students, always having an interference in the organization of the moments of learning, as in the challenges proposed and in the moments of mediation between students and the common cultural heritage. We defend that is important to understand that "the role of teachers is to create the conditions and participate, as actors, in the development of the communication process that can help students to achieve their learning" (Cosme & Trindade, 2013:45).

All these questions require that the teacher's role must be seen in its complexity and cannot be confined to the act of teaching, but expanding to other acts such as: organizing, challenging, proposing, mediating, "decisive and insoluble tensions that emerges from the fact that students should be encouraged to assume a greater pedagogical role and that teachers have to deal with this purpose in a context marked by pedagogical commitments that cannot be ignored, or by various contingencies that contribute to the complexity of this exercise" (Trindade & Cosme, 2010: 79). We argue that, despite the importance of the centrality of the student in the learning process, this cannot imply a renunciation by the teacher and by their educational influence.

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## IMPLICATIONS OF SEXUAL DEVELOPMENT OF LGBT CHILDREN AND YOUTH FOR SEX EDUCATION CURRICULUM

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### Abstract

Sexual formation is a key developmental factor for children and youth in the transition from childhood to adulthood that informs sex education curriculum in Canada. Of particular importance is the inclusion of sexual development of both heterosexual and non-heterosexual (Lesbian, Gay, Bisexual, Transgender, Two-spirited, Intersex, Queer, and Questioning (LGBT)) children and youth. We conducted a research synthesis based on resources drawn from both the academic and grey literature. The search of academic literature included materials published between 2009 and 2016, although some seminal articles and other resources from earlier than 2009 were included. Most of the literature was based on heterosexual development. Nonetheless, our findings indicated that developmental pathways are similar for both groups, but also differ in important areas. The formation of gender identity occurs in middle childhood (ages 6 to 12); however, for some children, the gender identity does not align with their biological gender. Depending on their experience and the intensity of their experience, children may fear their impending entry into puberty. Their secondary sex characteristics will develop and will be visibly incongruous with their gender identity, possibly causing them to feel negative impacts. Minimal research has been completed regarding the development of non-conforming gender identities and where research exists, much has been completed with those who have sought medical treatment, including mental health treatment for the difficulties they faced. Sexual orientation also begins to emerge in middle childhood. Practitioners are finding that children are disclosing their sexual identities (i.e., “coming out”) earlier than they have previously. In addition, middle-years children are now experiencing early onset puberty in larger numbers than in previous generations, thereby creating major developmental challenges for children affected. With puberty, many social issues may arise regarding dating and association with peers. Further issues may arise at school related to the gender binary presentation of sex education materials and the likely absence of information about gender dysphoric children and non-heterosexual orientations. Sex education is intended to aid the child in developing sexually within physical, cognitive, emotional, and social domains and to prevent early engagement in sexual activity and outcomes that can flow from lack of knowledge such as teen pregnancy and contracting sexually transmitted infections. We will present the findings of our research synthesis regarding LGBT sexual development and discuss the implications of these findings for the sex education curriculum for children and youth.

**Keywords:** *Sexual development, gender identity, sexual orientation, sex education curriculum.*

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## **ARE ILLUSTRATIONS AND TEXTS IN PICTURE STORYBOOKS INNOCENT? NATURAL ENVIRONMENT MESSAGES TRANSMITTED**

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### **Abstract**

This study critically examines the natural environment messages given in the picture storybooks and it's primarily focused on the messages given through the illustrations and the texts of the books written for preschool children. The purpose of this qualitative study, where case study was used, was to examine the illustrations and texts in the picture storybooks for 3-to-6-year-old children with respect to positive and negative natural environment messages. The data was collected by document review and examined by content analysis with the help of 3 forms developed by the researchers. For this purpose, at the beginning of the study, 954 books in the Children's Library located in a leading university in a capital in Europe were scanned. After the copies were eliminated, the remaining books were evaluated, first, whether they were directly related with natural environment, and second, whether they had living organisms - natural environment interaction. As a result, a total of 58 books were analyzed by the researchers. Before analyzing the data, researchers did the reliability and validity tests. At the end of the data analysis, it was found out that the writers and the illustrators were mostly giving positive natural environment messages to young readers but in a few books, maybe unconsciously, they gave negative natural environment messages to children. Accordingly, both kinds of these environmental messages were explained thoroughly and by these messages, some examples of positive/negative environmental perceptions which might occur in children were given.

**Keywords:** *Picture storybook, illustration, text, natural environment message, preschool.*

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### **1. Introduction**

Picture storybooks, one of the leading materials of children's literature, which is crucial for children's language development, especially in preschool, make it easier to acquire information through illustrations. When children meet picture storybooks, they can easily access visual information through the illustrations and written information by the texts. The illustrations that reflect the content of the language used through texts in picture storybooks are the greatest supporters of teachers on effective teaching (Soydan, 2014).

As well as the texts and illustrations in picture storybooks, the characters in the stories are important elements in children's lives. Children learn especially from the behaviors of the characters in the books. This learning can be either positive or unintentionally negative. One of the prominent researchers of the field, Sever (2003, pp. 64-65) describes the strong relationship between the characters in the children's books and the readers with these words: "Children, with the help of characters, learn the events which may easily be experienced. Also, they can get clues about attitudes or behaviors in problem situations. For this reason, the characters in the picture storybooks should be introduced to children for displaying positive behaviors towards nature. Since young children take the characters in the picture storybooks as role models (Bulut & Kusdemir, 2013), it is a fact that characters in these books play a vital role in the personality development of children (Mardi, 2006).

As it is mentioned by Sever (2003), one of the contributions of the illustrations in the picture storybooks is to teach children to be sensitive about the nature they live in. Therefore, to use children's books and especially the illustrations in these books as a support material would be wise in teaching children about global topics like nature (Muthukrishnan & Kelly, 2016) and for children's development of natural awareness.

As Bronfenbrenner (1979)'s research suggests, while working with young children, the child's immediate surroundings need to be taught first. By being role models, children can be taught some behaviors like to clean and protect the environment since young children imitate what they observe.

Children who developed the sense of responsibility about their surrounding environment, may be more thoughtful for social and global nature problems in the future.

With the activities; such as language arts, play and drama in preschools, children can be informed about nature (Ileri, 1998). One of the most important aims of the picture storybooks is to help children love people, nature and life (Cilgin Sinar, 2007; Cakir Ilhan 1994). The more the child gets this feeling at a young age, the more it would be permanent (Cabuk, 2000). Likewise, by stimulating the feeling of curiosity towards their environment, picture storybooks help children have the desire for exploring the nature and also they may give an opportunity to children for developing their imagination (Dincer, 1999). Preschool teachers may scaffold the children for getting information in subjects like importance of nature, sustainability, *harmony with nature* (Orr, 1990) and *consciousness of place* (Capra, 2000) by giving positive nature messages via the books read in their classrooms.

## 2. Objectives

For this study, studies in Turkey (Alan, 2015; Ugurlu, 2013; Yilmaz Genc & Ozen Uyar, 2016; etc.) particularly related with teaching children about nature by picture storybooks were analysed and it was found out that the number of studies, especially qualitative studies, was limited. Moreover, some of the studies were related with books for elementary school and upper level children (Aydin & Sevinc, 2016; Aslan, 2015; Canbay & Edizer, 2012; etc.). Thus, the purpose of this qualitative study was to examine the illustrations and texts in the picture storybooks for 3-to-6-year-old children with respect to positive and negative natural environment messages. In the light of this purpose, these questions were investigated: (1) Are preschool picture storybooks directly/indirectly related with the topic of natural environment? (2) Which types of living organism-natural environment interactions are found in preschool picture storybooks? (3) Which types of positive/negative natural environment messages in terms of living organism-natural environment interaction are contained in the illustrations and texts in the preschool picture storybooks? (4) What are the perceptions of natural environment in children which can be formed by positive/negative natural environment messages in the illustrations and texts in the preschool picture storybooks?

## 3. Design

This qualitative study, where illustrations and texts in the picture storybooks were analysed, is a case study. Case study is used for revealing the reasons, thoughts and attitudes when the case is unclear or changeable and content in it is uncertain (Creswell, 2016). In this study, criterion sampling in purposeful sampling method is used. Data received from pictures storybooks by document analysis is resolved by content analysis.

In this qualitative study, validity and reliability studies were made to be evaluated the subject objectively by the researchers. According to Merriam (1988), validity reflects the reality of the collected data in qualitative studies. On the other hand, reliability is about reproducibility of the research results. If the study was repeated and the same results were attained, the study would be reliable.

## 4. Methods

For the study, data was collected by three forms developed by the researchers. These forms are: (1) "Book Classification Form" used for determining living organism-natural environment interactions, (2) "Book Information Form" used for recording the selected books and (3) "Natural Environment Messages Form" used for determining the positive/negative natural environment messages given in pictures storybooks.

In this study, books which are appropriate for the selected criteria among 8077 books in Children's Library located in a university were analyzed. After defining the criteria, 954 books which are suitable for 3-to-6-year-old children were selected. Then, second and third copies of the books were eliminated and the remaining books (n=671) were examined by the researchers interactively. In the next step, researchers decided whether books have direct/indirect living organism-natural environment interaction and therefore 79 picture storybooks were chosen for analysis. Afterwards, these 79 picture storybooks were crosswisely by the researchers to continue analysis individually. Finally, with 58 picture storybooks which researchers agreed to have positive/negative natural environment messages, analysis were completed.

## 5. Findings, Conclusion and Discussion

It was found out that 62.1% of 58 picture storybooks (n=36) were directly related with natural environment and 37.9% of these books (n=22) were indirectly related with natural environment. Similarly, a study (Uzmen, 1993) in which native language and foreign language picture storybooks were examined. It was found that native language picture storybooks mentioned the topic of “nature-environment” were in the second rank and foreign picture storybooks mentioned the topic of “animals” were in the third rank.

It was stated that out of 58 books, 67.2% of them (n=39) have human-natural environment interaction, 29.3% of them (n=17) have animal-natural environment interaction and 3.5% of them (n=2) have plant-natural environment interaction. At this, the living organism which interacts with the natural environment is the character which is in the book. In contrast to this result, in Sahin & Isitan (2013)’s study, animals characters were the most used ones in the 3-to-6-year-old children’s picture storybooks. Animal characters in the native language books were 53.4%, in the foreign language books, they were 71.4%; human characters in native language books were 31.1%, and in foreign language books, they were 25.7%.

82.8% of 58 books (n=48) examined in the study have positive natural environment messages and 17.2% of these books (n=10) have negative natural environment messages. Given positive natural environment messages in the books with the theme of “more than one nature element”, there are 3 natural environment messages. (“We should protect nature elements.”, “We should take precaution to protect nature elements.”, “We should be aware of the importance of nature elements.”)

Given positive natural environment messages in the books with the theme of “plants”, there are 9 natural environment messages. (“We should recover the damages given to plants.”, “We should try to recover the damages given to plants.”, “We should be concerned about plants to be damaged.”, “We should plan to recover the damages given to plants.”, “We should prevent the plants from damages.”, “We should be aware that plants are living organisms.”, “We should avoid the plants to be damaged.”, “We should be sensitive for plants not to be damaged.”, “We should be aware of negative results of the damages given to plants.”)

Given positive natural environment messages in the books with the theme of “animals”, there are 5 natural environment messages. (“We should be aware of the animals’ habitats.”, “We should help animals.”, “We should be aware that animals are living organisms.”, “We should not be interfere in animals’ habitat.”, “We should try to recover the damages given to animals.”)

Given positive natural environment messages in the books with the theme of “earth”, there are 2 natural environment messages. (“We should recover the damages given to earth.”, “We should prevent the earth from damages.”)

Given positive natural environment messages in the books with the theme of “water”, there are 3 natural environment messages. (“We should be aware of the damages given to water.”, “We should recover the damages given to water.”, “We should raise awareness of others to recover the damages given to water.”)

Given positive natural environment messages in the books with the theme of “air”, there is 1 natural environment message. (“We should raise awareness of others to recover the damages given to air.”)

It is showed that the most messages were given in the topic of “plants”. Similar to this result, in the study of Muthukrishnan and Kelly (2016), 7 children’s books were examined and it was found out that in 32% of the 384 illustrations, only plants were painted.

The illustration and the text of one of the positive messages related with the message of “We should protect nature elements.” were given below:



*“This king works for the happiness of his people, he has protected nature with care. He takes care of the trees, prevents the pollution of the water, consciously processes the earth. So the country was covered with forests. The water flowed clearly, the soil gave fertile crops.”*

(In the original language) *“Bu kral halkının mutluluğu için çalışır, doğayı özenle korurmuş. Ağaçlarla ilgilenir, suların kirlenmesini önler, toprağı bilinçli işletmiştir. Bu yüzden ülkesi ormanlarla kaplıymış. Sular dırdurdu akar, toprak bereketli ürünler vermiş.”*

The message given by the example text and illustration may create a perception in the readers like "If the nature and, in particular, the trees are protected and water pollution is prevented, the water will remain clean. If the soil is consciously processed, the product is obtained in abundant quantities. Protecting nature is the benefit of all living things."

Given negative natural environment messages in the books with the theme of "plants", there is 1 natural environment message ("We can damage plants when we want to."), with the theme of "animals", there is 1 natural environment message ("We can damage animals when we want to"), with the theme of "water", there are 1 natural environment message ("We can remain unresponsive to the damages given to water"). Similarly, Marriott (2002) indicated that in 1074 picture storybooks, the natural characteristics of animals were not reflected and with these kinds of books, children's possibility to gain awareness towards nature would be low.

The illustration and the text of one of the negative messages related with the message of "We can damage plants when we want to." were given below:



"Quickly bring me the ax!" Jack dropped the bean tree by three strikes."

(In the original language) "Çabuk bana baltayı getir!" diye seslenmiş. Jack üç balta vuruşuyla fasulye ağacını yere sermiş."

The message given by the example text and illustration may create a perception in the readers like "It is acceptable for people to destroy plants for their profits."

## 6. Suggestion

Since preschool children were younger, their knowledge and experiences may lead their behaviors in the future. For this reason, the writers of preschool picture story books should be careful about giving positive natural environment messages to the children. Parallel to this, the illustrators of these books should evaluate the messages given in the illustrations hidden and obvious natural environment messages attentively. It should be considered that these messages can cause improper natural environment perceptions in young children.

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## **FIRST LANGUAGE VERSUS FIRST ADDITIONAL LANGUAGE(S) TEACHING IN FOUNDATION PHASE IN SOUTH AFRICAN SCHOOLS**

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### **Abstract**

In a multicultural society like South Africa, where eleven languages are regarded as official languages, usage of language contributes towards quality education. In terms of Section 6 the Constitution of the Republic of South Africa official languages are: Sepedi, Sesotho, Setswana, siSwati, Tshivenda, Xitsonga, Afrikaans, English, isiNdebele, isiXhosa and isiZulu. The question which arises mostly is whether these (especially) African languages are mastered by the children. The language of teaching and learning in most schools in South Africa is English. The paper investigated whether Foundation Phase learners are able to switch from mother tongue (first language) to second language (first additional language) without challenges. Quantitative design was used where questionnaires were used to collect data. Ten (10) Grade 3 teachers from Sibasa Circuit were purposefully sampled as participants. The research paper found that, it is not difficult for learners to learn first additional language before they master their own first language. It is not difficult for learners to comprehend what they have read in first additional language.

**Keywords:** *Mother tongue, Second language, First additional language, Education Language Policy, First language.*

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### **1. Introduction**

South African Department of Education due to its diverse society promotes multilingualism. Diverse society comes from Whites who speak English and Afrikaans and Blacks (Africans) who speak Sepedi, Sesotho, Setswana, siSwati, Tshivenda, Xitsonga, Afrikaans, English, isiNdebele, isiXhosa and isiZulu. Whites and Blacks speak eleven languages mentioned above. All these languages are official in term of Section 6(a) of South African Constitution. Children from different cultural backgrounds have to use their own mother tongues (First Language) to communicate. When they start their education, from Grade R to Grade 2 they are supposed to be taught in their mother tongues (First Language). In terms of Language Education Policy of 1997 all learners shall offer at least one approved language as a subject in Grade 1 and Grade 2. From Grade 3 (Std. 1) onwards, all learners shall offer their language of learning and teaching and at least one additional approved language as subjects. In most cases by Blacks, additional approved language is English.

### **2. Language Proficiency**

According to Slavin and Cheung (2003) for many years, the discussion about effective reading programmes for English language learners has revolved around the question of the appropriate language of instruction for children who speak languages other than English. Proponents of native language instruction argue that while children are learning to speak English, they should be taught to read in their native language first, to avoid the failure experience that is likely if children are asked to learn both oral English and English reading at the same time. Children are then transitioned to English-only instruction when their English is sufficient to ensure success, usually in third or fourth grade. Alternatively, many programmes teach young children to read both in their native language and in English at different times of the day. There is an opinion by Fillmore (1991) that once children learn English, they tend not to maintain or to develop the language spoken at home, even if it is the only one their parents know.

### 3. First Language

Clarke and Milne as quoted by Clarke (2009) are of the opinion that the first language, learned in the home, is extremely important and forms the foundation for all later language development. Parents, family members and early childhood professionals are the most significant influences on the development and maintenance of the first language. Clarke (2009) goes on to state that evidence shows that young children can learn more than one language with ease, as long as they are exposed to good language models and have plenty of exposure to both languages. Maintaining the first language does not interfere with the learning of first additional language. Research suggests the opposite—that knowing one language can help the child understand how other languages work. The maintenance of the first or home language is particularly important for the child’s development of a positive self-concept and well-being.

### 4. Importance of Learning First Additional Language

According to Lang (2009) and Frontier Academy (2014) if young children are taught how to speak a first additional language it is good for their minds. First additional language learning does not cause language confusion, language delay or cognitive deficit, which have been concerns in the past.

Researchers agree that the earlier a child starts learning a second language, the better, for more reasons than one. Some researchers say that first additional language acquisition skills peak at or before the age of 6 or 7. Others claim that this window extends through puberty. But, they all agree that it’s much harder for a child beyond puberty to learn a new language (Clark, 2016). Clark (2016) further states that bilingual children do not only speak two languages sooner than other single-language peers, but they are also better in tasks that call for a shift in attention. Also, research has demonstrated that children who first mastered their mother tongue and then learn a second language become fluent in the first additional language but never managed to attain the level of excellence of those that learned both languages at once. Frontier Academy (2014) and Steele (2014) state that there are reasons why children benefit from learning first additional language. The reasons are as follows: Better Linguistics; Cognitive Benefits; Enhanced Thinking Skills; Literacy Skills Enhanced; Higher Academic Achievement; Cultural Enrichment; and Societal Contributions.

### 5. Research Design and Methodology

Quantitative design was used where questionnaires were used to collect data. Grade 3 ten (10) teachers from Sibasa Circuit were purposefully sampled as participants. Data was analysed using SPSS Version 22 software.

### 6. Data Analysis, Discussion and Findings

The following discussion is analyzing data and discussing the findings.

#### 6.1. Section A Biographical Information

*Table 1. Gender.*

|              | <b>Number of participants</b> | <b>Percentages</b> |
|--------------|-------------------------------|--------------------|
| Male         | 6                             | 60%                |
| Female       | 4                             | 40%                |
| <b>Total</b> | <b>10</b>                     | <b>100%</b>        |

At least 60% of participants are males. Researchers thought that most males do not teach Grade 3 as compared to females. Surprisingly, 40% of respondents are females given that several literatures show that Foundation Phase classes are always associated with female teaching career (Mashiya 2014; Jungert et al. 2014; Petersen 2014; Mukuna & Mutsoso 2011; Sumsion 2005; Hofmeyr & Hall 1995).

*Table 2. Teaching experience.*

|                                 | <b>Number of participants</b> | <b>Percentages</b> |
|---------------------------------|-------------------------------|--------------------|
| 1-5 years teaching Experience   | 3                             | 30%                |
| 6-10 years teaching Experience  | 3                             | 30%                |
| 11-15 Years teaching Experience | 2                             | 20%                |
| 16-20 Years teaching Experience | 0                             | 0%                 |
| 20 years above                  | 2                             | 20%                |
| <b>Total</b>                    | <b>10</b>                     | <b>100%</b>        |

Respondents vary according to experience. At least 80% of participants have 1-15 years of teaching experience. It is only 20% of respondents who have 20 and more than 20 years of experience. With this kind of experience researchers believe that they have participants who are well experienced. A study by Yusuf & Dada (2016) on the impact of teachers' qualification and experience on the performance of students show that learners who are taught by experienced teachers perform much better than those who are taught by inexperience and less qualified.

## 6.2. Section B

Table 3. Learners understand their first language(s).

|                   | Number of participants | Percentages |
|-------------------|------------------------|-------------|
| Strongly disagree | 3                      | 30%         |
| Disagree          |                        |             |
| Neutral           | 1                      | 10%         |
| Agree             | 3                      | 30%         |
| Strongly agree    | 3                      | 30%         |
| <b>Total</b>      | <b>10</b>              | <b>100%</b> |

According to Mulkey (2012) supporting first language literacy goes beyond preserving cultural connections and providing a soft landing. Research over the past three decades increasingly demonstrates that continuing language and literacy in the first language alongside the development of the new language is in the child's best academic interests. It is understandable that 60% of participants agree that learners understand their first language. Continuing language and literacy in a child's mother tongue or first language is important not only for subsequent language development, but also for their overall personal and educational development. At least 30% of participants disagree that their learners understand their first language. This means that the participants have a long way to go in teaching their learners their first language. A study by Govender (2010) on 'Isizulu-Speaking Foundation Phase Learners' (ISFPLs) Experiences of English as a Second Language in English Medium Schools' found that teachers believed that Isizulu speaking learners were happy to be enrolled in English medium schools and showed predominately positive attitudes about learning English. However, teachers noted that such ISFPLs have serious cognitive challenges with regard to reading, writing, and comprehension (Govender, 2010).

Table 4. Use of language policy as a tool in my teaching.

|                   | Number of participants | Percentages |
|-------------------|------------------------|-------------|
| Strongly disagree | 0                      | 0           |
| Disagree          | 0                      | 0           |
| Neutral           | 3                      | 30%         |
| Agree             | 4                      | 40%         |
| Strongly agree    | 3                      | 30%         |
| <b>Total</b>      | <b>10</b>              | <b>100%</b> |

The Language Education Policy came into being in 1997. Some of the aims of the Language Education Policy are to promote full participation in society and the economy through equitable and meaningful access to education. According to Language Education Policy from Grade 3 (Std 1) onwards, all learners shall offer their language of learning and teaching and at least one additional approved language as subjects. It is encouraging to find out that 70% of participants make use of Language Education Policy. Adherence to policy is very important. Policies are there to give guidance to the implementers. It is interesting to find out that 0% of participants disagree with the statement (Govender, 2010).

Table 5. Ability to comprehend what they have read.

|                   | Number of participants | Percentages |
|-------------------|------------------------|-------------|
| Strongly disagree | 1                      | 10%         |
| Disagree          | 1                      | 10%         |
| Neutral           | 2                      | 20%         |
| Agree             | 5                      | 50%         |
| Strongly agree    | 1                      | 10%         |
| <b>Total</b>      | <b>10</b>              | <b>100%</b> |

At least 60% of participants agree that their learners can comprehend what they have read. Researchers agree that 40% of participants who do not agree with the statement is high. This becomes a serious concern. Texas Educational Agency (2002) states that over the past few decades, research has

revealed a great deal of information about how readers get meaning from what they read and about the kinds of instructional activities and procedures that are most successful in helping students to become good readers. For many years, reading instruction was based on a concept of reading as the application of a set of isolated skills such as identifying words, finding main ideas, identifying cause and effect relationships, comparing and contrasting and sequencing.

*Table 6. Switching to first additional language is a challenge to learners.*

|                   | <b>Number of participants</b> | <b>Percentages</b> |
|-------------------|-------------------------------|--------------------|
| Strongly disagree | 1                             | 10%                |
| Disagree          | 0                             | 0%                 |
| Neutral           | 0                             | 0%                 |
| Agree             | 6                             | 60%                |
| Strongly agree    | 3                             | 30%                |
| <b>Total</b>      | <b>10</b>                     | <b>100%</b>        |

It is true that switching to first additional language is a challenge to learners as 90% of participants agreed. There are several challenges to switch to first additional language as Wilson (2016) states: Grammar; Vocabulary; Slang and colloquialism; Pronunciation; Variations in English

*Table 7. It is a challenge to switch to first additional language for learners who have not mastered their first language.*

|                   | <b>Number of participants</b> | <b>Percentages</b> |
|-------------------|-------------------------------|--------------------|
| Strongly disagree | 0                             | 0%                 |
| Disagree          | 0                             | 0%                 |
| Neutral           | 0                             | 0%                 |
| Agree             | 5                             | 50%                |
| Strongly agree    | 5                             | 50%                |
| <b>Total</b>      | <b>10</b>                     | <b>100%</b>        |

It is a challenge to switch to first additional language for learners who have not mastered their first language as 100% of participants have indicated. Cook (2013) states that many scholars are advocating for letting the children learn through a language they know well for the first six years at school while at the same time ensuring that English is also introduced as a subject as a co-teaching medium.

## 7. Conclusion

The study concludes that it is necessary for learners to learn first additional language at a tender age. The crafters of Language Education Policy were right in introducing first additional language to learners. Learners' cognitive development is also considered in learning first additional language. There is no harm in introducing first additional language to learners as participants indicated. At the tender age of the learners, learners are able to pronounce words properly as their tongues are still flexible to can talk and read.

## 8. Recommendations

The paper recommends that learners need to be taught first additional language at a tender age. Learners have ability to master languages at an early age of their lives as indicated by this paper. South African language Policy should be adhered as the document which has guidelines on language teaching in primary schools.

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## DEVELOPMENT OF FUNCTIONAL THINKING IN PRIMARY SCHOOL CHILDREN USING EARLY ALGEBRA

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### Abstract

The purpose of this paper was to develop functional thinking in third grade students (around 9 years old). A psychoeducational strategy was planned, using basic understanding schemes, when handling quantities of water. To promote the understanding of quantitative relationships, quantity was manipulated by passing water from one vessel to another and translated into arithmetic representations as well as algebraic equations.

A group of 26 children were divided into teams to promote collaborative work and thus foster distributed cognition, where advanced students help to less advanced. The teams manipulated a fixed amount of water (10 centimeters) passing the water from one glass to another and wrote their arithmetic representations. They then put the data into a table in which the numerical relationships were ordered. Later, the data were transposed to an algebraic representation incorporating the notion of variable, using quantities in vessel A and B, as well as the constant X, where the constant was 10 cm, so that  $A + B = X$ , for example:  $3 + 7 = 10$ . Finally, the algebraic equation was represented with a line on the Cartesian plane.

All children were able to understand and represent relationships in arithmetic (numerical) expressions and linear graphs. 83% of the children were able to understand the variable relationship ( $A + B$ ) of the amount of water distributed in the vessels, and move to the algebraic function represented by the equation  $A + B = X$ .

**Keywords:** *Functional thinking, distributed cognition, representation, transfer, early algebra.*

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### 1. Introduction

The teaching of mathematics is a discipline of first importance in the basic education curriculum in Mexico, for its potential to develop reasoning in students. However, the importance given to mathematics teaching in the Program for International Student Assessment (PISA), Mexico score well below the international average. Although the problem of teaching mathematics is global, this is shown by the low percentages obtained at the upper levels of the PISA test, even in the countries with the highest scores (PISA, 2013).

Given this problem, an approach has been developed that proposes to promote the logical thinking of algebra in the first years of primary education (NCTM, 2000), which is known as Early Algebra (Kaput, 2008, Blanton & Kaput, 2005). From the point of view of Psychology, logical thinking develops from very early ages in the interaction of everyday experiences, forming what are called schemas, according to Piaget's theory (1970), which are basic schemas of understanding. The daily experiences that occur in the interaction with objects have a phenomenal character, while the child interacts with the objects of reality, hence the conceptual basis of understanding and not the other way around. In the present work, when children observe the behavior of water when transferring from one container to another, they are phenomenally observing a process of addition-subtraction, one container is emptied as the other is filled, in the dynamics of exchange, the Child observes the distribution of water in a sequence of quantity changes within a continuum, this promotes the conceptual bases that can crystallize in a functional thought, in a function, that algebraically can be mathematized and expressed as  $A + B = X$ .

In Psychology it has been appreciated that cognitive phenomena are not given only in the individual, but in their interaction with the environment. Cognition is distributed in objects and in people, what one does not know the other can know, which one does not think the other can think, which does not remember one can remember it other; In such a way that the interaction enriches the cognitive activity of

the individual. Hence, creating educational designs where collaboration is promoted enriches the formative experiences under the principle of distributed cognition.

A relevant point of educational designs is to evoke the responses in students to build their understanding. In order to promote the construction of algebraic expression in children, a modeling procedure can be used (Sadovsky, 2005), in which students are helped to conceive the subsequent responses, which corresponds to the approach of the Zone of Next Development (Vygotsky, 1980).

## 2. Objectives

The purpose of this study was to: Design, apply and evaluate a psycho-educational strategy based on a phenomenal experience (hands on), to promote the understanding of functional thinking between two variable quantities in relation to a constant, by provoking transference in different representations: arithmetic, Graphical and algebraic.

## 3. Methods

The procedure was based on a group design that worked with a group of standard academic performance, considering that within the heterogeneity of the children can establish points of comparison to appreciate different characteristics associated with school performance. Qualitative and quantitative analyzes are performed in the study.

## 4. Subjects

We worked with 32 students enrolled in the 3rd grade of the public elementary school "Amado Nervo" of the State of Mexico, with an age ranging from 8 to 9 years. With the purpose of creating a dynamic of work by collaboration, 16 work teams were intentionally formed. Each team was formed by a student of high and low academic performance, under the principle of promoting the Zone of Close Development

## 5. Process

A psycho-educational arrangement was designed in which the realization of phenomenal experiences (hands on – learning by doing) was used as the basis of the process. Schoolchildren manipulated quantities of water as they were transferred from one container to another. They were made to appreciate to the students that the quantities that remained in a glass and in the other were variables, constructing thus the notion of variable. In order to generate a basis of regularity in the face of variance, it was promoted to define a unit as constant, thus constructing the notion of constant. This was done by asking the children to generate the equality of the amount of water in each glass of each team, so that a constant would remain. This constant was decided to define it precisely, for it was established a height equivalent to ten centimeters, and marked that height, conforming the constant, thus with a precise metric measurement, to give operational to the measurement of quantity.

Each team was equipped with a pair of transparent containers. They were graded on the scale from zero to ten centimeters using a ruler. Water was provided to almost fill one of the vessels to the constant value (ten centimeters). Teams were invited to exchange a certain amount of water, making the distribution to be in closed amounts (from zero to ten), so that they will not handle fractions of centimeter. In this way, a diversity of quantities was generated in each team. Each team was asked to dictate the quantities they had in their glasses, so that some reported having two centimeters in a glass and eight in the other, another team four and six, others one and nine, and so on. In such a way that, the distribution of the quantities is explained in the blackboard, inviting one of the teams, only when the quantity was repeated, to give us another relation that was not given. This numeric table was organized in a decreasing order in a data table, so that it would be ten - zero, nine - one, eight - two, etc. Thus, the numerical relationship of the phenomenon observed in the quantities of water contained in the containers and transferred to a data table was represented.

Subsequently, the base was drawn on the board to transfer the relationships observed in the table, to a graph. Each of the quantities was dictated by each team, putting a point at the intersection of the axes: two - eight, four - six, three - seven, etc. In this way, the numerical expression is transferred to the linear representation in the positive quadrant of the Cartesian plane.

Based on the data table and graph, teams were invited to how they could be expressed in general using literals the numerical relationship observed in both the table and the chart. They are made to appreciate to the students that the numerical value that is in a vessel has a univocal relation with the quantity of the other vessel, that they are two interrelated variables that always add up the value of the constant, so that the variable number of A container can be called with a generic letter, for example "n" of number as well as the other quantity that is in the other recent, so that, if you add the value of an "n" to the other "n" We must give the constant, in our case ten, what is explicit in both the table and the graph, representations that have been previously understood by children, so that it is understandable "n" plus "n" equal to (N + n = 10), which allows us to transfer the same relationships identified to a representation given by an algebraic equation ( $n + n = x$ ).

### 6. Result

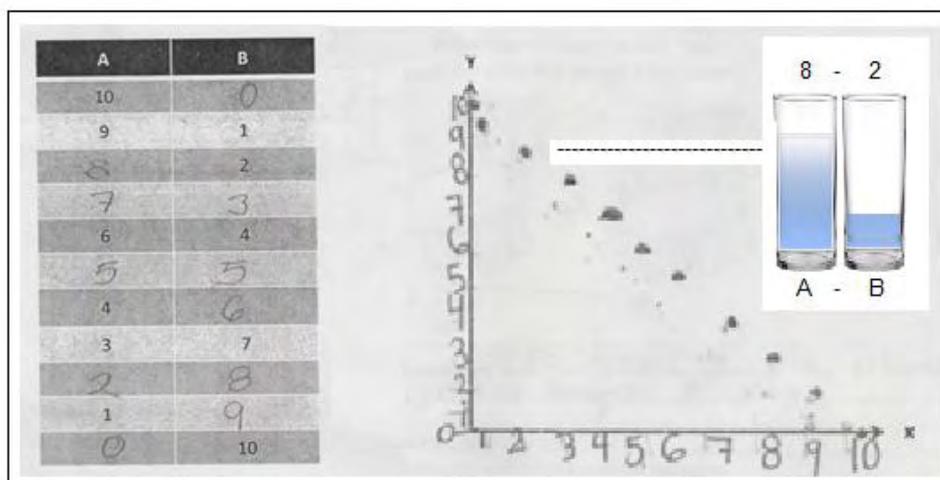
100% of the students were able to put the quantities observed in their containers in the data table, which is extremely important because the phenomenon (direct observation of the phenomenon - quantities of water in a container) is transferred to a value numeric. A little less than half (46.8%) constructed the relation: while one gains the other loses water, and conversely, always maintaining the constant of ten centimeters of water, which constitutes the notion of function. However, 94% were able to understand the univocal relationship, if there are 8 in one container in the other there are 2 and construct an arithmetic representation, expressed in an organization hierarchized in a data table.

Figure 1. Notion of relationship.



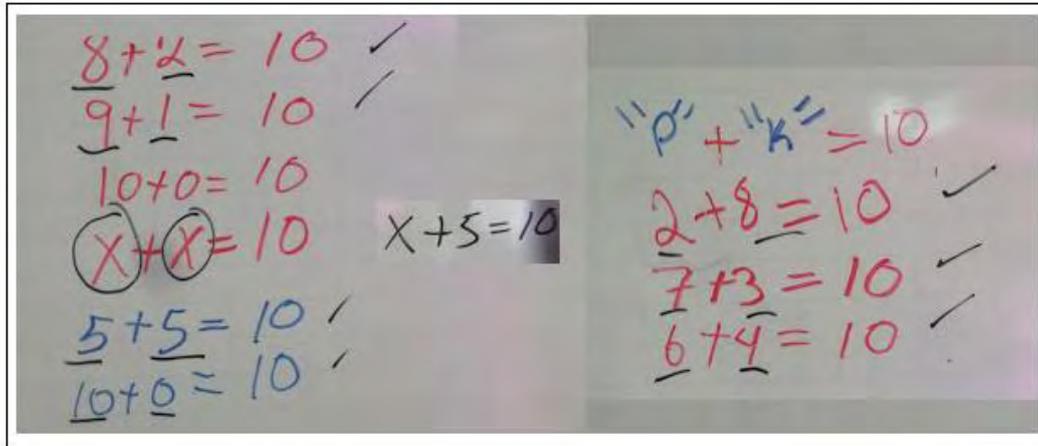
In the next phase, 71.8% of the students were able to transfer the data expressed in the numerical table to a graphical representation of the linear equation in the positive quadrant of the Cartesian plane.

Figure 2. Transfer to the Cartesian Plane.



Finally, the transfer of the data expressed in the numerical table and the linear equation in the Cartesian axis to a representation in algebraic equation was promoted. 28% of the students were able to represent the algebraic expression ( $X + 5 = 10 / P + K = 10$ ).

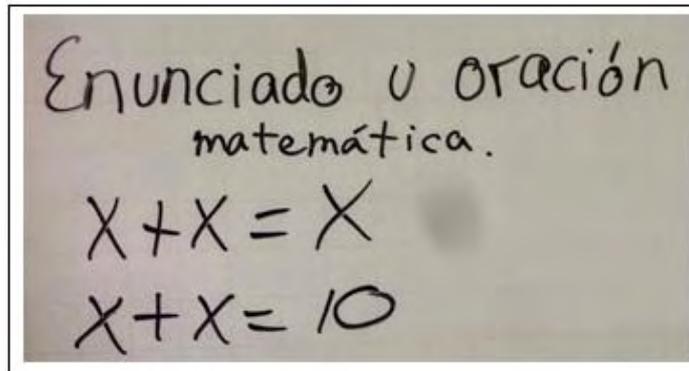
Figure 3. Transfer to a representation in algebraic equation.



### 7. Discussion

Based on the results, it is noteworthy those children present different phases in their conceptual development, such as the meaning of literals. The children in their first expression in the form of an algebraic equation have limitations since the literal has a constant value "X", always takes the same value, which leads to an arithmetic aberration, as shown in its representation  $X + X = X$ , forgetting the value of the constant (10 centimeters), which is located in the second member of the algebraic expression, since the aberration  $10 + 10 = 10$  is created.

Figure 4. Arithmetic and algebraic expression.



Through a process of questioning of what each member represents and of arithmetic inoperability ( $X + X = X$ ), children are led to identify that this expression can be:  $X + X = 10$ , although it does not accommodate all pairs of univocal relationships observed in water quantities. This leads us to retake the constant and change literals to move from the notion of unknown to the construction of the notion of variable, which allows us to represent all the relations of univocal quantities contained in the vessels.

Although only 28% of the students were able to construct the algebraic expression of the problem, it seems to us a good result, as the equation represents a synthesis of complex abstraction, and the students are children between 8 and 9 years old.

It is important to note that, as usually happens in all school groups, there is diversity and not all students are the same. Some children fail to get involved in the experience, they lose the rhythm of understanding what is being done. Others are careless about their parents (they do not have school supplies). There is also a problem with absenteeism, 26% (8 students) were absent. These problems may partly explain the diversity in the results obtained.

## 8. Conclusions

From the educational design applied, it was possible for the children to transfer from a phenomenal experience to an arithmetic representation in a data table, later transfer from the data table to the graphical representation and finally, from the graphical representation transfer to an algebraic equation. The transference from one context to another explains the children's understanding of different ways of representing the concrete phenomenon observed when a certain amount of water flows from one vessel to another, implying that they were able to develop functional thinking. All these activities are part of the functional thinking proposed by Kaput (2008).

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## MENTAL HEALTH LITERACY DEVELOPMENT IN PRE-SERVICE TEACHER EDUCATION

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### Abstract

Health literacy, including mental health literacy, has been internationally recognized as a strong predictor of health outcomes (World Health Organization, 2013). Mental health literacy is fundamental to improving knowledge about mental health, decreasing stigma and thereby enhancing help-seeking behaviours. The need for mental health literacy for teachers is important, particularly for those working in middle and secondary schools, as the ages 12 to 25 years are those during which most mental disorders can be diagnosed and constitute the largest component of the burden of illness during this phase of the life-span. Improving teachers' mental health literacy may lead to enhanced access to effective mental health care for students, thus helping to decrease negative outcomes associated with undiagnosed and untreated mental disorders in young people, such as poor academic and vocational achievements, social dysfunction, and early mortality due to suicide.

There is a lack of both in-service and pre-service teacher professional development in mental health literacy in Canada. These shortcomings are occurring even though pre-service teacher preparation is known to be critical for equipping teachers with the knowledge and skills to address mental health concerns in the classroom. To address this gap, we modified and implemented a mental health literacy professional development program, originally created for and provided to in-service classroom teachers, and delivered it to a group of pre-service teachers studying in a large Canadian Faculty of Education.

Sixty pre-service teachers participated in a professional development session and completed a survey on their mental health knowledge, attitudes towards mental illness, and help-seeking efficacy. Participants completed an anonymous mental health knowledge and stigma survey before and directly after the training session and again three months later. One-way repeated-measures analysis of variances (ANOVA) were used to explore to impact of the professional development session on knowledge and attitudes from the pre- and post-session surveys, and follow-up surveys; and paired samples t-test was applied to assess the help-seeking from the pre-session and follow-up surveys. Compared to baseline data, results demonstrated significant and substantial improvements on all three outcomes immediately following the session and after three months.

Provision of mental health literacy education among pre-service teachers may be an effective approach to help them better address student mental health needs in their future teaching career.

**Keywords:** *Mental health, pre-service teachers, teacher education, schools.*

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### 1. Introduction

Teachers play an important role in being aware and knowledgeable about youth mental health and mental disorders, especially as symptoms are often observable during adolescence. The need to increase teachers' mental health literacy is recognized in Canada (Froese-Germain and Riel, 2012; Kutcher, Wei, & Coniglio, 2016; Mental Health Commission of Canada, 2013; Wei, Kutcher, & Szumilas, 2011) defined as a) understanding how to obtain and maintain good mental health, b) understanding mental disorders and their treatments, c) developing capacities to decreasing stigma, and d) developing capacities to enhance the ability to know when, where, and how to seek help (Kutcher, Bagnell, & Wei, 2015; Kutcher, Wei, & Coniglio, 2016). To date, several Canadian studies have demonstrated significant and sustained improvements in the mental health literacy of teachers and students with the implementation of an easy to use, freely available, web-based, and classroom-ready mental health literacy resource (Kutcher and Wei, 2015; Kutcher, Bagnell, & Wei, 2015; McLuckie et al., 2014; Milin et al., 2016).

While the positive impact of mental health literacy for teachers is now being recognized, reports from a number of national Canadian surveys continue to identify the need to enhance the mental health literacy levels of teachers (Froese-Germain & Riel, 2012; Mental Health Commission of Canada, 2013). As well, the lack of pre-service teacher professional development in mental health literacy is noted in a recent environmental scan (Rodger et al., 2013) that identifies a lack of mental health literacy curriculum within existing Canadian Bachelor of Education program curricula.

To address this gap, the authors (and two others not identified in this article) modified and implemented a mental health literacy professional development program, originally created for and implemented with practicing classroom teachers, and delivered it to a group of pre-service teachers in a large Canadian Faculty of Education. Based on prior research findings on implementation of the program among in-service educators, we hypothesized that, following the participation in the professional development program, pre-service teachers would demonstrate, 1) an increase in mental health knowledge; 2) a decrease in stigma; and 3) maintenance of these outcomes at a three-month follow-up.

## 2. Methods

### 2.1. Study design

This is a prospective cohort (pre, post and follow-up) study designed to observe a group of fifth-year undergraduate students at the Faculty of Education before and immediately after the training session on a mental health literacy curriculum resource as well as at 3-month follow-up.

### 2.2. Intervention and Procedures

Teacher candidates in the middle year and secondary year streams in the Faculty of Education at the University of British Columbia were enrolled in a single-day professional development session similar to one previously described for in-service teachers (Kutcher and Wei, 2014; Kutcher, Bagnell, & Wei, 2015; McLuckie et al., 2014; Milin et al., 2016). During the session, participants were introduced to basic concepts about mental health and mental illness and then to the classroom application of the classroom mental health literacy resource, the *Mental Health and High School Curriculum Guide* ([teenmentalhealth/curriculum.org](http://teenmentalhealth/curriculum.org), referred to herein as the Guide). The Guide had previously demonstrated significant and substantial impact on improving mental health literacy outcomes (knowledge and stigma) for both in-service teachers and their students across Canada (Kutcher & Wei, 2014; Kutcher, Wei, & Morgan, 2015; McLuckie et al., 2015; Milin et al., 2016).

The Guide is normally introduced as a classroom resource to teachers through in-person sessions during a day of professional development. Participants are introduced to key concepts related to mental health and mental illness contextualized to school settings. The Guide includes teacher resources that identify how to deal with students with mental health problems and mental disorders in the classroom.

### 2.3. Participants and assessment tools

Sixty middle and secondary school pre-service teachers (41 females, 18 males, and one who did not disclose gender) were invited by the Faculty of Education at the University of British Columbia in January of 2015 to participate in the one-day professional development session. Participants completed an anonymous mental health knowledge and stigma survey before and directly after the training session and again three months later. Questions were developed by a psychiatrist and mental health researcher and reviewed by educators and other mental health professionals to finalize the survey. To ensure anonymity, pre-service teachers were asked to not provide any identifying information on the survey forms.

### 2.4. Data analysis

One-way repeated-measures analysis of variances (ANOVA) were used to explore the impact of the GPPDP on knowledge and attitudes from the pre- and post-session surveys, and follow-up surveys; and paired samples t-test was applied to assess the help-seeking from the pre-session and follow-up surveys. Statistical Package for Social Sciences 17 was used to perform all data analysis. The significance level of  $\alpha = .05$  was used when comparing the p-values for each test.

## 3. Results

Post hoc analysis (Table 1) demonstrated that participants overall knowledge significantly improved immediately after the GPPDP session ( $p=.000$ , Cohen's  $d=3.1$ ), and their knowledge retained between baseline and 3-month follow-up ( $p=.000$ , Cohen's  $d=1.74$ ). Post hoc analysis (Table 2) also indicated that participants attitudes towards mental health (reduced stigma) improved significantly immediately after the training ( $p=.000$ , Cohen's  $d=1.18$ ) and at 3-month follow-up ( $p=.002$ , Cohen's  $d=.68$ ).

Table 1. Overall Knowledge Comparisons.

| K | K | Mean Difference* | Std. Error | Sig.** | 95% Confidence Interval for Difference** |             |
|---|---|------------------|------------|--------|--|-------------|
|   |   |                  |            |        | Lower Bound                              | Upper Bound |
| 1 | 2 | -9.436*          | .609       | .000   | -10.957                                  | -7.915      |
|   | 3 | -6.821*          | .684       | .000   | -8.529                                   | -5.112      |
| 2 | 1 | 9.436*           | .609       | .000   | 7.915                                    | 10.957      |
|   | 3 | 2.615*           | .533       | .000   | 1.284                                    | 3.947       |
| 3 | 1 | 6.821*           | .684       | .000   | 5.112                                    | 8.529       |
|   | 2 | -2.615*          | .533       | .000   | -3.947                                   | -1.284      |

Based on estimated marginal means. K=knowledge; 1=pretest; 2=posttest; 3=3-month follow-up.

\*The mean difference is significant at the .05 level.

\*\*Adjustment for multiple comparisons: Sidak.

Table 2. Stigma Reduction Comparisons.

| stigma | stigma | Mean Difference* | Std. Error | Sig.** | 95% Confidence Interval for Difference** |             |
|--------|--------|------------------|------------|--------|--|-------------|
|        |        |                  |            |        | Lower Bound                              | Upper Bound |
| 1      | 2      | -5.059*          | .714       | .000   | -6.854                                   | -3.263      |
|        | 3      | -3.029*          | .802       | .002   | -5.045                                   | -1.013      |
| 2      | 1      | 5.059*           | .714       | .000   | 3.263                                    | 6.854       |
|        | 3      | 2.029*           | .567       | .003   | .603                                     | 3.456       |
| 3      | 1      | 3.029*           | .802       | .002   | 1.013                                    | 5.045       |
|        | 2      | -2.029*          | .567       | .003   | -3.456                                   | -.603       |

Based on estimated marginal means. 1=pretest; 2=posttest; 3=3-month follow-up.

\*The mean difference is significant at the .05 level.

\*\*Adjustment for multiple comparisons: Sidak.

#### 4. Discussion

The results show that the mental health literacy professional development session and associated Guide may be an effective means to significantly improve pre-service teachers' mental health literacy: increasing knowledge, decreasing stigma and improving personal help-seeking intentions. In addition, these positive gains were evident at a three-month follow-up. To our knowledge, this is the first study of a mental health curriculum resource intervention involving Canadian pre-service teachers that has shown such significant results.

The increase of knowledge and decrease in stigma demonstrated by this group of teacher candidates is similar to results in studies assessing the impact of practicing-teacher professional development based on the Guide (Kutcher et al., 2013; McLuckie et al., 2014; Wei et al., 2014). These findings suggest that this may be an appropriate approach for faculties of education to adapt and apply to enhance pre-service educators' understanding about mental health as well as their capacity to help students once they become teachers. The timing of the session just before the teacher candidates started their school-based practicum likely led them to apply the new knowledge in their classrooms, which may have explained why the one-day training is different from traditional one-shot interventions and resulted in sustained outcomes at 3-month follow-up.

#### 5. Conclusion

To our knowledge, this is the first study on the use of a specific curriculum resource as a teacher education intervention ever reported in Canada and possibly globally. Albeit limited in some respects (lacking a control group), this cohort study of a sample of teacher candidates at the University of British Columbia showed significant and substantial improvement in mental health knowledge, decrease in stigma and enhanced help-seeking intent. Additionally, these improvements were sustained over time. Although further research is needed to replicate these findings in different teacher education programs, the results are robust enough and the need for teacher mental health literacy sufficiently great to suggest that teacher education programs consider implementing this intervention.

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# ENHANCING COGNITIVE DEVELOPMENT AMONG UNDERGRADUATES IN THE BIOLOGY CLASSROOM BY ACTIVE LEARNING THE PRINCIPLES, LOGICS, AND RATIONALES THAT DRIVE THE INFORMATION EXPLOSION IN MODERN (MOLECULAR) BIOLOGY

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## Abstract

The “information explosion” in molecular biology is causing undergraduate biology students to complain of “cognitive indigestion”. This is especially noticeable as the size of molecular biology textbooks increases. As well, the intellectual content of classroom lectures is changing away from traditional analyses of experimental designs and towards “information content”.

The signature feature of science—the use of a hypothesis to direct experimentation and assessment of subsequent evidence—is nowadays very often either supplemented (especially during beginning stages of a project) or replaced by alternatives to hypothesis testing. That is, high technology is increasingly being employed for “discovery-based” and/or “data-mining” endeavors. For the intrinsic value derived from those approaches to be understood by undergraduates, special efforts by the instructor are required. That is, to help students learn how to assign meaning to the data collected by those alternative endeavors, explanation of the driving force (e.g., logic/rationale) behind collection of specific data set provides a useful starting point.

Sample classroom exercises that foster the development of the requisite cognitive skills for understanding authentic contemporary professional-level data collection and evaluation are therefore described.

**Keywords:** *Information explosion in biology; discovery-driven science; data mining in biology; writing to learn science.*

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## 1. Introduction

As the global scientific enterprise in modern, Molecular Biology continues to develop at an astonishing rate, a trifurcation of the classical “hypothesis-driven” scientific method as the means for collecting novel information has emerged. That classical method employs a specific hypothesis as a starting point, followed by appropriate experimental tests, and finally an objective evaluation of the resulting data. The “scientific method” is usually introduced to students during their pre-college education. Indeed, one of the reasons science has traditionally “had a place” in the pre-college curriculum alongside literature, languages, mathematics, and music/art is the opportunity science presents as an evidence-based “way of knowing” (e.g., Moore, 1984).

At the university level the “information explosion” in modern biology has, however, led to a change in focus in the lecture classroom away from reviewing the “logics of hypothesis design” and towards “information content”. Various ways of coping—in the lecture classroom-- with that increased information flow, and opportunities to add meaning to new information are outlined and discussed below.

*The difference between information and knowledge becomes apparent when “meaning” is affixed to the information. (see Sensky, 2002).*

## 2. The Information Explosion has Caused the Intellectual Content of the Biology Classroom to Change

In the past few decades, supplementary approaches to the classical hypothesis-driven “way of knowing” are, however, increasing the challenge associated with helping students learn how scientists collect and evaluate information about the natural world. A “turning point” has in fact been identified:

The publication in 2003 of the complete nucleotide sequence of the human genome (reviewed in Sharp [2014]).

Having easy access to both the sequence methodologies, recombinant DNA technology, and DNA data banks (e.g., GenBank: <https://www.ncbi.nlm.nih.gov/genbank/>), has permitted scientists from virtually all sub-disciplines of biology (e.g., from Paleobotany to Medical Genetics) to collect unprecedented streams of data.

As a consequence of the resulting “information explosion”, the undergraduate classroom lecture has begun to morph into an exercise in “information compression”. That is, with the use of PowerPoint slides, mega-size textbooks, and internet links (including animations of molecular processes) it is now increasingly easy for a professor to present to undergraduates an almost unlimited amount of information in a typical one-hour lecture session. Lecture courses based on “high density” PowerPoint slides are quickly becoming the “norm” (Malacinski, 2016).

Thus, the combination of the information explosion and advances in electronic presentations in the classroom continues to distort the undergraduate student’s view of the unique feature of classical hypothesis-driven endeavors. The intellectual context of the typical biology classroom has been reduced. The lecture experience has increasingly moved towards electronically delivered “information compression”. Consequently, the teaching of various biology disciplines runs the risk of morphing into a descriptive/narrative discipline such as history, anthropology, or linguistics, rather than remaining unique as an evidence-based “way of knowing”.

Informal discussions with students in the author’s classes have provided the following typical comments:

*I don’t like PowerPoints in lecture because they present too much information to follow.*

*The only time I like PowerPoints in lecture is when the instructor puts them on the class website so all I need to do is spend time memorizing them for the exam.*

*Just tell me what details from all those PPT slides I need to know (to score high on the examination).*

Indeed, a recent study has concluded that “students perceived the instructor using power point as putting less effort in the class” (Sewasew et. al., 2015).

The development of analytical and critical thinking skills are thereby subverted by emphasis on information content. It is, therefore, little wonder that college students find lectures to be very boring (Bakak, 2014). This is especially true for biology courses that mimic “online courses” (Malacinski, 2016). That is, from the student’s point of view classroom experiences which are guided almost exclusively by PowerPoint presentations often represent “information overload” sessions.

Rather than “develop” topics on a blackboard or overhead transparency as practiced by previous generations of biology professors, an instructor simply “clicks” from one colorful, annotated slide to the next. Little wonder therefore that students are easily distracted during lecture (Madda, 2015). Often they deflect their thought processes away from the information content, and therefore lose focus. Engaging in social media on smartphones during classroom time continues to pre-occupy college students (McCoy, 2013).

### **3. A “Trifurcation” of the Classical Hypothesis-Driven approach to Research has been Facilitated by Sophisticated Technical Methodologies**

Table 1 contains a brief description of those supplementary approaches (#2 and #3) to “ways of knowing” which are increasingly dominating the accumulation of data in modern Molecular Biology.

*Table 1. Modern Approaches in Molecular Biology Research.*

| <u>Type of approach</u> | <u>Key feature Recent example</u>   |
|-------------------------|---|
| (1) Hypothesis-driven   | Expt. designed to test specific (Alzheimer’s disease, aspect of a phenomenon e.g., Underwood, 2016) |
| (2) Discovery-driven    | Search the unknown for clues (Human genome project, * re. function e.g., Li et al, 2011)            |
| (3) Data mining         | Search data bases for comparisons (Specific sequence comparisons/patterns e.g., Brar, 2016)         |

\*Many scientists originally protested against the funding the Human Genome Project. Since it was not hypothesis-driven, it was feared that it might take away from classical hypothesis-driven

research. The HGP was accused of "sucking *funds* from the sort of *hypothesis-driven science* that has led..." (<http://isj.org.uk/the-human-genome-project/>).

It should however be noted that approaches #2 and #3 often will eventually—in the research laboratory—provide background information as a starting point for traditional "hypothesis-driven research". For example, Li et al., (2011) for DNA sequencing and Brar (2016) for data mining provide research platforms for eventual "cause/effect" hypothesis-driven research.

#### **4. Sample Classroom Exercises that Foster Development of Requisite Cognitive (Critical Thinking) Skills for Assigning Meaning to Information Content**

In addition to lecturing to students about science, having students write about science provides an opportunity for university professors to engage students deeply in a collaborative experience. Indeed, writing about discoveries provides a way to "bring alive" information content from lectures or assigned readings. That is, writing provides a way to increase "inquiry-based" learning both inside and outside the classroom.

For hypothesis-driven research the search for "cause/effect" relationships is intrinsic to experimental designs. In contrast, discovery-driven and data mining exercises are occasionally actually categorized as "fishing expeditions" (reviewed in Weinstein (1998), Benderly (2013), and Lorsch (2014). In these latter cases a direct "cause/effect" relationship is usually not initially inferred. Thus, for students to develop scientific logic/reasoning skills, rather than simply memorize additional quantities of information, the following exercises have proven to be useful in our classroom.

Exercise #1: Request each student to search out 3 research journal reports that primarily employ a single technology (e.g., *gene editing with CRISPR-Cas9; embryonal stem cell differentiation; oncogene sequences in different species; etc.*). They are then assigned the task of summarizing the key discovery described in each of the 3 reports. Next, using Table I as a guide, identify the main data collection approach(es) employed. Then discuss the main "strengths" and "weaknesses" of the technological approach. Lastly, prepare a brief explanation of the "meaning" of the data included in the report.

Making distinctions between "cause/effect", correlative, or speculative relationships within the phenomenon being investigated in this exercise should enhance student's analytical/critical thinking skills.

Exercise #2: Offer students a list of contemporary research projects, and request that they choose one and write an essay on the subject of "how good is the evidence" that is used to support the author's conclusion. This exercise further emphasizes the development of critical thinking skills. Indeed, this task mimics the professional-level procedure routinely undertaken by scientific journal referees and editors!

Exercise #3: Require students to write a research proposal on a subject included in a long list of possible topics provided by the professor. The main focus of this exercise is the choice of investigative strategy (i.e., hypothesis, discovery, or data mining) and speculation re. the strength of the conclusion(s) that can be drawn from the expected/predicted data.

#### **5. Conclusion**

The above descriptions and exercises provide an opportunity to help students answer—for themselves—the following question: Why is "this or that" information important? The distinction between "information" and "knowledge" often depends on the manner (see Table I) in which the information was collected. With the exercises described herein students thereby directly engage in the intellectual features that uniquely characterize science as a "direct" way of knowing (Moore, 1984).

Should students also enroll in laboratory science courses, they will have the additional opportunity to comprehend the practical aspects associated with scientific discovery, and thereby fully understand the strength and weaknesses of various scientific endeavors.

Additionally, enhancing critical thinking and writing skills as detailed above (i.e., judging the quality of information, writing effectively, etc.) helps prepare students for careers in a modern digital environment, both inside and outside of science (see Percell et al., 2012).

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## TACKLING ECONOMETRICS TEACHING CHALLENGES: THE USE OF UNICODE IN HIGHER EDUCATION

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### Abstract

In the present research, we develop a teaching methodology to emulate statistics software to make econometrics lectures more approachable and understandable through *learning by doing* activities. The goal of this initiative relies on combining the interactive characteristics of a spreadsheet program and Unicode plain-text linear format for mathematical expressions. The advantage of Unicode standard is based on the easiness to write, and, even more importantly, to read. Also, with Unicode, mathematical expressions are more legible, and the resulting nearly plain-text can often be used with few or no modifications in other numerical computing environment as Matlab, Mathematica or Maple. Moreover, with these capabilities students can learn how to display and edit mathematical expressions in a built-up format in Word or Latex. To test our hypothesis that Unicode standard could be an appropriate tool for teaching econometrics, we perform an experiment with a group of students. Two main results arise: first, students using Unicode standard reduce their response time to mathematical questions, and the reduction is larger when the difficulty increases. Second, those students taught under Unicode standard present a learning curve: their response time decreases with difficulty.

**Keywords:** *Teaching tool, Unicode, spreadsheet, econometrics.*

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### 1. Introduction

When teaching basic econometric concepts, there is a language that, even being a common language in economics, tends to be neglected by students: *scientific mathematics*. Fortunately, there is a current of thought that promotes the use of spreadsheets tools in teaching econometrics, based on the fact that developing these skills might result useful to enhance learning. As has been pointed out by Cahill & Kosickit (2000) spreadsheets allow students to ‘*get their hands dirty*’ by working with concrete examples. Thus, spreadsheet interface forces students to understand and set up the fundamental relationships in a symbolic form and helps to make the concepts more accessible while allowing students to explore statistics concepts more deeply in the classroom.

In related literature, we find different contributions in this line. Brianda and Hill (2013) have argued that a spreadsheet environment, offers the opportunity to run a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results (Monte Carlo simulations) and to successfully teach students basic econometric concepts. Pivac et. at (2010) have applied a teaching approach in which the parameters estimation according to Engel's Law are obtained through Excel. Their results show that it helps many users to easily solve similar complex statistical and mathematical calculations in a spreadsheet based exercise, proving the usefulness and relevance for students of economic sciences in quantitative analysis. Basturk (2005) have found that students whose learn the introductory statistics could be improved successfully when the use of computer assisted instruction is used as a supplement to regular lecture in teaching basic statistics. These applications help to tackle difficult topics in economics more accessible since they can easily generate a wide range of quantitative solutions.

However, the traceability in these spreadsheet-based teaching tool turns out not understandable since there is a not direct correspondence with the instrument on the paper (Moro and Pedauga, 2016). This is because statistics expressions are not encoded as logical math formulas as they are introduced as abstract cell references – i.e., in a spreadsheet program as Excel, data is entered in an active cell using the “A1” reference style, referring columns with Alphabets letters and rows with numbers.

## 2. Objectives

To overcome this lack when teaching econometric, our proposal combines the interactive characteristics of spreadsheet programs, but using logical notation based in the Unicode plain-text linear format for mathematical expressions to develop a statistical emulator designed in a spreadsheet behavior. The advantage of Unicode standard is that it has been designed to be easy to write, and, even more importantly, easy to read (Sargent III, 2010). Also, with Unicode standard, statistical expressions are more legible, and the resulting statistical emulator, we propose here can be used with few or no modifications in other numerical computing environment as Matlab, Mathematica or Maple. Also, formatted mathematical expressions can be used as such for simple documentation purposes, given that this capability is considerably enhanced by the possibility to display and edit using the same expression in typesetting programs as Word or LATEX.

## 3. Methods

We have applied our statistical emulator with economic students at University of León (Spain). In our teaching experience, we have perceived excellent results: “our students learn in just a few sessions how to describe the heuristics, program a proper simulation code and calibrate a variety of econometrics model in a computer lab designed with an end-user spreadsheets simulation tool”.

Our intuition (based on our experience but not tested) is that with Unicode students can more easily understand mathematical expressions and represent them more legibly, and the resulting nearly plain text can be easily used with few or no modifications for such calculations in Excel. To measure the effectiveness of our learning activities, we have designed an experiment in which we try to test the capacities of the students (measured in time) to identify the equations of a specific model.

In this computer experiment, the challenge for the students is to identify the corresponding formula expressed on pencil and paper within the calculation carried out in a spreadsheet designed for this purpose. Each individual in the study is faced with a set of different tasks, which, for analytical purposes, have been divided into four categories. The first category (called Control) is the sole control task, which repeats the same example given in the instructions and has been applied in order to verify that the instructions have been understood correctly. The second category or Level I is a starting level of algebraic difficulty in which the candidate is faced with four mathematical expressions whose formulation is designed using only parameters. The formulas increase in complexity as the test progresses. The third category or Level II is thus of a greater level of complexity, in which the subjects are also faced with four mathematical expressions but these include both parameters and variables, and are thus more difficult. In the fourth and last category, the test subjects tackle a different task in which they must identify from within a possible group of formulas that which corresponds to the specification of the ordinary least square model. We call this the Model category.

The individuals were divided into two groups. The control group corresponds to those individuals who had received a traditional introduction to the use of spreadsheets, focused on learning how to introduce formulas in Excel and how to apply the concepts of relative and absolute formulas using the A1 reference style. The second group was made up of those students who, in the introductory process to using Excel, had been taught to define parameters and variables following the Unicode standard convention proposed in this article. Both groups were faced with the same group of formulas, but the first group was only given formulas designed using the A1 format within the spreadsheet, while the second group was given formulas in the Unicode style. The results for the case of the less difficult level of formulas showed no evidence of a significant mean difference between the two groups.

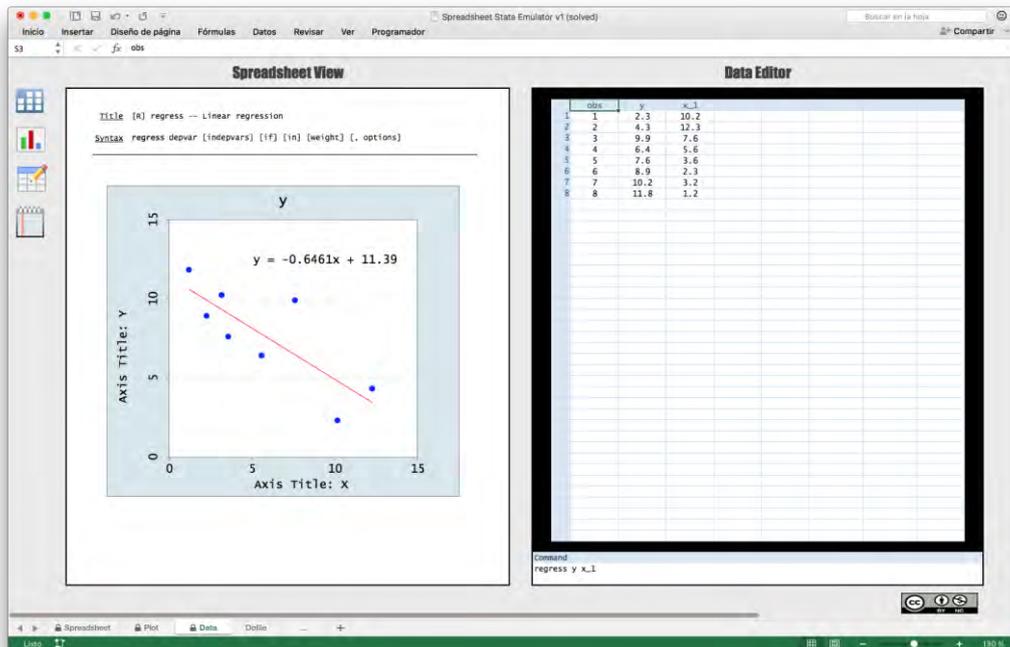
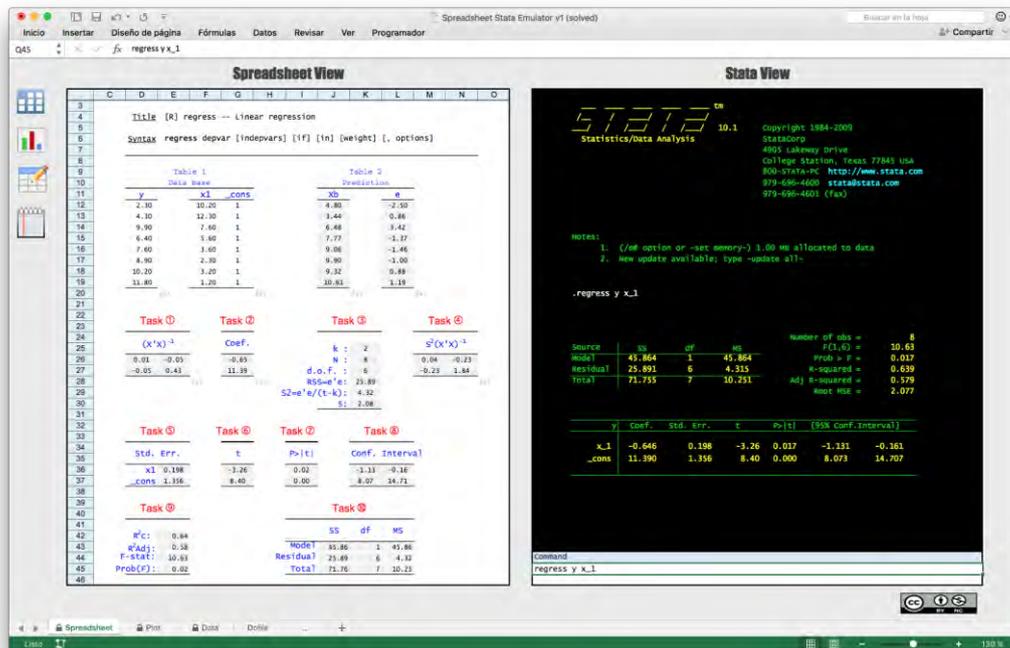
In spite of the fact that the “A1 reference style” group in general requires more time to detect the correct answer, this does not prove significant. But when we look at the group of questions that incorporate both parameters and variables in their formulation, the mean for the “A1 reference style” group is significantly higher than the Unicode group mean. This result is also repeated for the test in which the students must correctly identify the econometric model.

## 4. Discussion

It is interesting to note that student group facing the problems using the Unicode emulator reveals a learning curve, due to the fact that a decreased tendency is observed in the response time, despite the increasing difficulty of the tasks, something not witnessed for the A1 reference style group. Therefore, the results found demonstrate the advantage of incorporating the Unicode convention into the design of the emulator programs in the teaching-learning process, given that this new method complements the benefits gained by the students from the use of simulation programs as Excel. Moreover,

with these capabilities students learn how to display and edit mathematical expressions in a linear form that is useful for editing formulas in Word or [La]Tex.

Figure 1. Spreadsheet Emulator.



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## **THE DIFFICULT SECOND ALBUM: WHY WE MUST START TEACHING COMPUTER SCIENCE IN SECONDARY EDUCATION AGAIN**

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### **Abstract**

In this paper we present an assessment of the pedagogical effectiveness of several computing related educational outreach activities undertaken by Queen's University Belfast (QUB) in partnership with a number of Northern Irish Schools. Outreach activities included: a Computer Science Teacher Upskilling Programme, a Code School and a Sphero Challenge. Each activity has provided thought-provoking pedagogic experience for academics, teachers and students alike. The Computer Science Teacher Upskilling Programme (CSTUP), is a Department of Education (DE) funded programme, run by the School of Electronics, Electrical Engineering and Computer Science (EEECS) at QUB. It aims to upskill teachers to deliver qualifications with programming elements in schools to meet DE's strategic objective 'to provide a curricular framework that reflects the needs of the economy of the future'. Code School is a six week after-school club arranged at local schools, supported by QUB EEECS staff and students. It has engaged more than 120 school pupils aged 11 - 14 who, due to socio-economic background, may not have considered further education as an option or indeed have little knowledge of STEM subjects and careers. The programme encourages pupils to learn how to code, to develop apps, programs and games and to explore technology. The Sphero Challenge is a problem-solving challenge, in which a wireless programmable robot is controlled using a tablet computer. QUB sets several challenges for both primary and secondary school students. Each activity has exceeded its targets of out-reach to School teachers and pupils. Sphero Challenges have promoted the development of problem solving skills. Code School has specifically targeted girls to help reduce the recognised gender divide in students choosing to study or work in the Software industry. The CSTUP has been successful but also identified that the two-year programme has not been long enough and continued support is still needed. We reflect on our ongoing research into the effectiveness of computing-related outreach activities in the context of primary and post-primary education. The paper contributes to debate surrounding the ambition of the UK government to see a move away from Information Communication Technology (ICT), and toward computing subjects, in the classroom. It will be of interest to academics and practitioners seeking to uncover the most effective way that Higher Education institutions can support primary and secondary schools in this transition.

**Keywords:** *Computer Science, Secondary Education, Outreach, Coding, Software Development.*

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## **1. Introduction**

Computer science is a branch of science that deals with the theory and methods of processing information in digital computers, the design of computer hardware and software, and the applications of computers. Computer science, in its form as a rigorous taught academic subject, is now almost omnipresent across the tertiary-level education sector. The same cannot be said for computer science in secondary-level education institutions. Over the last 20 years the provision of computer science has been eroded in secondary-level teaching by the prominence of Information Communication Technology (ICT) in the National Curriculum.

### **1.1. The role of ICT in Education**

The subject of ICT was originally designed as a broad-brush introduction to the aspects of applied computing, a suitable preparation for those students who would be expected to be proficient in the use of computer programs in a workplace environment. ICT was not designed to provide preparation for

those students that would eventually be designing, developing and deploying computer systems and software projects in a professional capacity.

In 2012, The Royal Society in London published a report, ‘Shut down or restart?’ (The Royal Society, 2012). This seminal investigation, which details the way forward for computing in United Kingdom (UK) schools, assesses the current provision for Computing (as an academic subject) in schools in the UK. It also seeks to understand what, if any, preparation ICT affords students as they exit secondary education to commence Computing disciplines at university or in the workplace.

Indeed, the first main finding of the report from the Royal Society report says:

*The current delivery of Computing education in many UK schools is highly unsatisfactory. Although existing curricula for Information and Communication Technology (ICT) are broad and allow scope for teachers to inspire pupils and help them develop interests in Computing, many pupils are not inspired by what they are taught and gain nothing beyond basic digital literacy skills such as how to use a word-processor or a database.*

The report goes on to state, that:

*There is a need for augmentation and coordination of current Enhancement and Enrichment activities to support the study of Computing.*

Change came in short order. In late 2012, Ofqual (The Office of Qualifications and Examinations Regulation) which regulates qualifications, examinations and assessments in England and vocational qualifications in Northern Ireland, initiated reform of AS and A level<sup>1</sup> qualifications (Ofqual 2015). This included reform of computer science and ICT subjects at AS and A level. The timeline for delivery of these revised subjects was set for the years 2015 to 2019. At present all of the English examination boards have produced revised A level computer science qualifications for delivery from 2015.

In 2013, the local Northern Ireland examining board, CCEA (Council for the Curriculum, Examinations & Assessment), introduced a new A level specification entitled Software Systems Development (SSD) (Council for the Curriculum, Examinations and Assessment, 2015). CCEA, encouraged by universities and industry alike, developed new curriculum to teach and assess the fundamental concepts of computer programming, including Object Oriented Programming (OOP) and Database Design.

There is also strong demand from industry for graduates skilled in computing (this area of industry is sometimes known as the ‘tech sector’). The latest ‘Tech Monitor’ report (KPMG, 2015) from KPMG (a global network of professional services firms) outlines the demand from the tech industry in the final quarter of 2014. The report states:

*Tech sector job creation and new business trends also exceeded UK-wide benchmarks by substantial margins in the final quarter of last year, with firms citing a wave of new product launches and greater investment spending.*

## 1.2. What’s next?

Each year QUB admits over 400 students to Computer Science, or Computer Science-related, courses where each student is required to undertake and pass a module in computer programming including OOP. At tertiary level education there is good demand for students with strong OOP skills.

An artifact of the relatively recent introduction of SSD at A level is the chronic shortage in Northern Ireland of teaching staff with the corresponding skills and experience needed to teach OOP. The Computer Science Teacher Upskilling Programme, which is a Department of Education (DE) funded programme, run by the School of Electronics, Electrical Engineering and Computer Science (EEECs) at QUB is a response to this skills. The programme aims to upskill teachers to deliver qualifications with programming elements in schools to meet DE’s strategic objective ‘to provide a curricular framework that reflects the needs of the economy of the future’.

The absence of computer science in the National Curriculum has also had an impact on the number of young people interested learning to programme.

In response to this, QUB established a voluntarily attended computer coding group, called Code School. Code School activities were designed to target secondary school pupils aged 11 to 14. The

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<sup>1</sup>A Level (Advanced Level) is a subject-based qualification conferred as part of the General Certificate of Education, as well as a school leaving qualification offered by the educational bodies in the United Kingdom.

sessions were delivered by QUB staff and final year QUB students and provided the secondary school pupils with an introduction to programming within a relaxed, social learning environment.

Finally, QUB also offered the ‘Sphero Challenge’. This is a problem-solving challenge, in which a wireless programmable robot is controlled using a tablet computer. Several challenges are set for both primary and secondary level school students.

## 2. Effectiveness of outreach activities

### 2.1. Computer Science Teacher Upskilling Programme

In June 2014 the Department of Education (DE) in conjunction with Invest Northern Ireland (INI) funded Queen’s University Belfast (QUB) to deliver a two-year programme of teacher upskilling. The aim of the programme was to equip selected teachers with the skills needed to successfully deliver A level computer science programmes, such as the CCEA’s Software Systems Development.

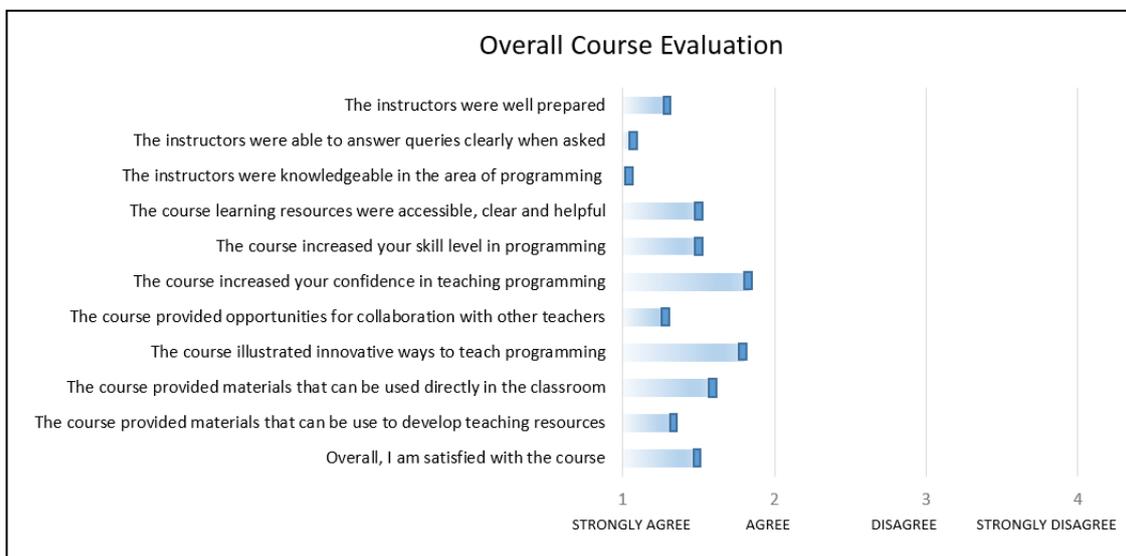
The objectives for the programme were to:

- Upskill a total of 40 teachers to deliver computing courses (20 by September 2015, and a further 20 by September 2016).
- Develop materials that teachers can use in their delivery of A level computing courses.
- Increase the number of schools delivering A level computing courses and also the number of students taking such courses.

Demand for upskilling from teachers considerably exceeded initial expectations and resulted in additional upskill courses being delivered. A total of 115 teachers from 69 different schools and colleges completed the programme and received materials to support course development. Feedback from the teachers on the course has been very positive.

Early indications of increased pupil uptake are also very positive, with a growth of 206% in the numbers of pupils taking an A or AS level qualification in computing between 2013/14 and 2015/16. After each course, the teachers were asked to evaluate the course delivery quality. The average question evaluation across all three cohorts is given in Figure 1. All response averages fall within the Strongly Agree to Agree categories, indicating that the courses were positively received by the teachers.

Figure 1. Combined delivery evaluation.



### 2.2. Sphero Challenge

The Sphero is a wireless programmable robot, the same size and shape as a cricket ball. The robot is programmed using a tablet computer and QUB sets a number of challenges for students of both primary and secondary school age to solve. One such challenge asks the students to program the robot such that it can traverse a pre-defined course drawn on a large mat placed on the floor.

Students are given access to a Sphero robot, a tablet computer and are allowed to measure the course using a tape measure. They are not, however, allowed to practice moving the Sphero around the course drawn on the mat. Instead, the students must program the robot’s movement based on the measurements that they made.

The aim of the project is to promote the development of problem solving skills. The students are given minimal instruction on the techniques required to program the robot, rather they are given an outline of the task and left to bootstrap the skills needed to solve the problem.

Anecdotal evidence from students and teachers has shown that the Sphero challenge is not only popular, but moreover does actively develop a student's ability to diagnose and solve complex problems. More importantly, whether the students realise it or not, the Sphero Challenge provides a solid foundation for schools to teach their students how to write simple computer algorithms to solve problems.

### 2.3. Code School

Learning to program a computer is difficult, and novice programmers experience a wide range of difficulties while learning their craft (Robins et al, 2003). Furthermore, as reported in the ACM report, "Running on Empty" (ACM, 2016), exposure to positive computing experiences in mainstream education is lacking. Code School neatly fills this void: it does not assume any prior programming knowledge and is delivered in a relaxed yet engaging manner.

As part of the Code School provision, QUB undertook a study with the aim of establishing if the secondary level education pupils' career aspirations, experiences and attitudes are reflective or consistent with regard to another similarly aged group that has a self-selected involvement with computing (McGowan & Anderson, 2015).

The study found, perhaps unsurprisingly, that Code School attracts school students who already have an interest in computing and are significantly more attracted to computing careers compared to their peers. Before the Code School was delivered, on average 34% of all surveyed pupils indicated they were interested in a career in computing. After the Code School, the number of students interested in a career in computing increased to 59%.

### 3. Conclusions

Each scheme has excelled its initial targets of out-reach to School teachers and pupils. Sphero Challenges have promoted the development of problem solving skills. Code School has played an important role in the development of students' programming skills in secondary-level education and promoted the Software industry as a career path for students. Demand for both the Sphero Challenge and the Code School (from both primary and secondary schools) has consistently outstripped the ability of QUB to facilitate such events. The CSTUP has been successful but also feedback from schools and teachers involved identified that the two-year programme has not been long enough and continued support is still needed.

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## INTEGRATING LAPTOP COMPUTERS: A LEARNING PROCESS FOR BIOLOGY TEACHERS

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### Abstract

The paper describes a study on teacher insights, defined here as their capacity to intuitively discern the true nature of a situation. Insights can be based on deep, clear, sudden, possibly unique, perceptions of a specific cause and effect in a specific context. This descriptive study documents the learning processes of high school biology teachers as they integrate laptop computers in their classrooms, the key factors about the integration process, and how the integration was accomplished. The teachers considered the acquisition and use of teaching materials to be an important aspect of integrating laptop computers into instruction and identified ongoing challenges for accessing appropriate professional development, and for sharing knowledge, skills, and teaching materials. This study found that integrating laptop computers into instruction was a positive experience for the biology teachers interviewed and suggests specific areas in which teachers need additional support in order to sustain successful integration. The primary fact that emerges is the central and critical role that teacher learning plays in the development of new instructional technologies such as the successful integration of laptop computers.

**Keywords:** *Laptops, Biology, Integration, Secondary, Quantitative.*

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### 1. Introduction

Literature on implementing laptop programs indicates that teachers must have information on how laptop instruction could be integrated into their specific subject area as well as support to effect this integration. Research into laptop applications to curriculum, implementing laptops in content areas, and insights into the pedagogical needs of individual teachers is recommended.

Despite assumptions that how laptops would be used in curricular instruction is obvious (Donovan, Hartley, & Strudler, 2007), teachers who undertake this innovation generally have little assistance and can experience stressful intellectual, pedagogical, and time demands. Researchers call for studies on teacher insights into integrating laptop computers in science instruction because, despite their relevance, these studies are not easily accessed by practicing teachers (Dunleavy & Heinecke, 2004; Tebbutt, 1999).

### 2. Design of the Study

Qualitative research is used to collect data on 'how' and 'what' questions and where the researcher has no control over the event being studied (Yin, 1994). Stake (1994) observes that qualitative research is used to study phenomena that take a long time to happen, which evolve along the way, and where it often takes a long time to understand what is going on. This qualitative study was designed to describe biology teachers' insights. It was not designed to test hypotheses or develop theory.

### 3. Objectives

Researchers have observed that teachers with strong subject matter knowledge employ, or consider, more effective or innovative teaching strategies (Becker, 1994; Davis, 2006), and confirm that biology teachers bring creativity and commitment to integrating innovations in their classrooms (Simmie, 2007). When multiple simultaneous change is required for an innovation to be implemented, it is the individual teachers who determine what innovations, and how innovations, will be implemented in the classroom (Cho, 1998). Researchers anticipated laptop programs would address concerns science teachers

cited as discouraging them from integrating desktop computers, and would encourage teachers to alter their teaching practices, leading to less teacher-centred and more student-centred instruction (Inan, Lowther, Ross, & Strahl, 2010).

In reviewing the literature, quantitative researchers (Dunleavy & Heinecke, 2004; Inan & Lowther, 2010) identified the need for a body of knowledge, pedagogy, and theory on integrating computers in science instruction. Qualitative researchers (Erixon, 2010; Varma, Husic, & Linn, 2008) confirmed that these needs have not been met and are ongoing.

## 4. Methods

Appropriate strategies were selected for collecting data for a descriptive study. Three semi-structured one hour interviews were conducted. The first interview reviewed teacher background, gathered information on changes in teaching approaches, and the use of new instructional materials. The second interview was used to gather the teachers' insights into integrating laptops into instruction and to request samples of new teaching materials they had prepared. The third interview explored the teachers' perception of their future plans for laptops in their instruction. Follow-up questions and informal interviews were used to investigate any remaining issues.

### 4.1. Data Collection and Analysis

Data collected were analyzed in an inductive process (O'Leary, 2009). Recordings of interviews were converted to a computerized transcript and analyzed by hand. The initial themes and categories developed were entered into NVivo and the text was coded. NVivo structures and organizes data, making it easier to integrate additional data, and re-analyse new themes (Richards & Richards, 1994; Willis & Jost, 1999).

### 4.2. The Participants

A purposeful sample (Merriam, 1998) was sought of Ontario teachers who were successfully teaching biology in the final two years of high school where teachers and students had access to personal laptops and the same software. Sites were selected where laptops were used with a range of software, probes and data-bases to enhance the learning of science, not just being used as word processing and presentation tools (Stolarchuk, 2001).

## 5. Results and Discussion

All the teachers who volunteered had strong academic backgrounds: degrees in science and biology from Ontario universities. Five had Master's degrees and two had started Ph.D. programs.

As a group, these teachers also had strong professional backgrounds for teaching biology. For most, this involved certificates and specialist qualifications from the Ontario Ministry of Education. Eight teachers had completed B.Ed. degrees, almost all from Ontario universities, and had done the majority of their practice teaching in Ontario high schools. At the time of the study, they were teaching in schools which followed the Ontario Curriculum. All taught Biology 11 and/or 12, often including International Baccalaureate (IB) or Advanced Placement (AP) Biology.

The teacher-volunteers in this study had implemented and were sustaining a laptop program in senior grade biology courses (pseudonyms have been used). Their degrees and specialization in their subject area meet the description of teachers willing to investigate integrating innovations (Becker, 1994; Davis et al., 2006; Simmie, 2007).

Their insights into their experiences are discussed under the following headings: Integrating laptop computers; Integrating laptops in science education; Teaching approaches when integrating laptops; New teaching materials when integrating laptops; and, Supports and challenges when integrating laptops.

### 5.1. Integrating Laptop Computers

The teachers' insights into integrating laptop computers were remarkably consistent. *It was a big adjustment for the students as well as the teachers, so it didn't happen quickly (Adele, I -247)*. While implementing a laptop program is a school-based decision, Information Technology (IT) departments typically may not provide subject specific organization and assistance to the teachers as recommended (Inan et al. 2010). *IT are more general ... in terms of science -specific technology we're... on our own (Xandra, I-99)*. Rogan, (2007) comments on the lack of understanding in schools and school systems regarding the enormity of the changes required of science teachers when they implement laptop

computers. Moore (2004) and Anderson (2008) confirm that teachers in schools are often asked to deal with different patterns of innovations at the same time; from externally motivated patterns determined by others, such as administrative initiatives, to internally motivated patterns where teachers design and implement their courses, year after year in response to changes which they do not control.

## 5.2. Integrating Laptops: Science Instruction

Although successful integrators of laptops, almost all the biology teachers in the sample had not chosen to use the desktop computers which had been available in their schools for instruction. *I didn't use them very much because it was hard (Keith, III- 409)*. Laptops appeared to have solved problems the teachers had associated with using desktop computers. *If (the laptops) weren't right there in the classroom I wouldn't use them (Darby, II-259)*. The teachers interviewed accommodated periodic updates of the laptops and the peripherals they needed to teach biology, and the unintended consequences of incompatibility between new and older laptops and the peripherals, with the perception that newer hardware and software was faster and easier to use. For the majority of teachers, the changes to their science instruction had been profound.

## 5.3. Integrating Laptops: Teaching Approaches

Laptops affected the teaching approaches the teachers used in their biology courses. *They can access course material on their laptops at home, from anywhere around the world ... and ...around the school (Keith, II-123)*. The smallest change appeared to be in assessment procedures where the teachers continued to use written tests and mark hard copies of students' work. *I don't feel comfortable ... I could use the tools that exist. I just don't feel I want to (Keith, II-437)*. Other teachers in the study were prepared to wait until new technology and software were available in their schools (Landry & Hartman, 2006). But, as a result of the new teaching approaches they did introduce, the teachers listed a number of ways the courses they were now teaching were better, using such terms as: more relevant; more up-to-date; more interesting to the students; more student-centred than before; and, providing better preparation for studying biology at the post-secondary level. While they believed that their new approaches to instruction using laptops had increased communications between students, between teachers and students, and between parents and teachers, there was still little evidence of increased communications beyond the walls of the school; between students in different schools, between teachers in different schools, or with experts in appropriate scientific fields.

## 5.4. Integrating Laptops: Teaching Materials

Despite the changed approaches in instruction, the change the teachers described in their preparation and use of new teaching materials was even more significant. The teachers in this study discussed at length the teaching materials they accessed and how this was affecting their use of textbooks (Erixon, 2010; Woody, Daniel, & Baker, 2010). There is a great variation in the Internet sites being selected by the teachers and how the materials they choose are incorporated into their instruction (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010). The teachers deemed PowerPoint presentations to be efficient since they could be used for instruction in a number of different ways. Similarly, at the University of Ontario Institute of Technology (UOIT) researchers find PowerPoint presentations are used to display course notes and other materials during class as well as to introduce topics, organize lectures and assist students with notetaking (van Oostveen & Muirhead, 2007). These researchers observed that faculty teaching science courses at UOIT used laptops differently from faculty teaching other subjects, an opinion also expressed by the teachers in this study. Barab & Dede (2007) found that game-like virtual learning experiences provide a strong sense engagement and opportunities for student learning, only to discover during their research that teachers were providing this type of experience in science at the secondary level. While new teaching materials were researched, and assembled with considerable care and expenditure of teachers' time (Savoy, Proctor, & Salvendy, 2009), there was little evidence that they were shared with other biology teachers and, in contrast to the increasing use of Internet resources, textbooks appeared to be less important in their classrooms.

In many ways, the teachers believed their new teaching materials made classroom teaching easier despite the ongoing incompatibilities in hardware, peripherals and software and the ongoing loss of teaching materials obtained from the Internet.

## 5.5. Integrating Laptops: Supports and Challenges

None of the teachers in this study expressed an interest in returning to pre-laptop teaching instruction, despite a sense of pedagogical isolation.

The teachers provided insights into supports, including: anecdotal feedback from students, alumnae/i, and the school community; the improvement they perceived in their practices; the availability

of professional development; the improvement they perceived in student learning; the availability of the peripherals and software they had been able to obtain to teach biology; and, by access to up-to-date technology. These insights are validated by Bell & Bell (2005), Harvey & Kamvounias, (2008), and Newhouse (2001). The teachers identified challenges as they developed their use of laptops for instructional purposes, including: finding professional development appropriate for senior grade biology teachers in a laptop program; accessing ideas for new teaching approaches from peers; and locating and obtaining new teaching materials for their classrooms. *How can this be done now? ... I would say through teachers sharing ... a technology conference ... where teachers share (Darby II- 39).*

Some of the supports listed are also identified as challenges: they are supports which remain inadequately or incompletely implemented.

## 6. Conclusion

A number of researchers confirm the insights expressed by the teachers in this study; that teachers need more subject-specific knowledge and assistance if they are to integrate laptop computers into instruction; that a lack of appropriate, and subject-specific professional development for science teachers in laptop programs persists in school systems; and that the teachers need academic as well as technical support in their subject area (Ainley, Friedman, Gebbart, & Macaskill, 2015; Eickelmann, Gerick, & Boss, 2015; Law, Yuen, Wang, & Tse, 2015; Siddiq & Scherer, 2015). It has also been noted that teachers prefer to receive this subject specific professional development from those who teach, or have taught, the courses they are teaching (Bell & Bell, 2005).

The insights of the teachers included recognition of the challenges they had faced in introducing laptop instruction into their classrooms, and the fact that, in most instances, they felt that they had met those challenges. Once the laptop program had been established in the school, they designed, implemented, and sustained the innovations in their classrooms. They perceived that integrating laptops into their courses was an ongoing implementation process for reasons beyond their control, including new curriculum, new course assignments, and the introduction of new hardware and software.

This study found that integrating laptop computers into instruction was a positive experience for the biology teachers interviewed and suggests specific areas in which teachers need additional support in order to sustain successful integration. The primary fact that emerges is the central and critical role that teacher learning plays in the development of new instructional technologies such as the successful integration of laptop computers.

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# **RELIGIOUS DIVERSITY IN A MULTICULTURAL SOCIETY: WHAT WE CAN LEARN FROM THE HISTORY AND MANDARIN TEXTBOOKS IN TAIWAN**

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## **Abstract**

It is important to cherish and promote multi-religious competence and literacy in a multicultural society in addition to the issues of racial/ethnic, class, gender diversity. The perspectives and world views that textbooks carried reflect the cultural heritage and social ideology in a changing society. The major purpose of this study was to investigate what kinds and in what degree of religious diversity, tolerance, and imbalance embedded in the textbooks of junior-high schools in Taiwan, as well as how teachers' and experts' interpretations are. Data derived from qualitative approach provided significant information to answer the related research questions. The research findings include the following: (1) religious diversity more or less showed on Mandarin and history textbooks in Taiwan, while some preference and imbalance were also founded; (2) the narrative way of political perspective on textbooks is highly stronger than the perspective of cultural exchange; (3) keeping balance between religious localization and globalization is a better way to face the religious diversity of student composition in a changing Taiwanese society; and (4) the empowerment of teachers' multi-religious competence and literacy is urgently needed, so that could further enhance students' multi-religious knowledge, respect, and tolerance.

**Keywords:** *Multicultural society, religious diversity, religious tolerance, Taiwan, textbooks.*

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## **1. Introduction**

The school education and textbook teaching which reflected cultural heritage and social ideology is kind of a miniature society of the large society. The points are what, how and why to present via textbooks, and what kinds of improvements can be further done.

Taiwan is a multicultural and definitely not a monolingual society although the percentage of the population of the major five racial/ethnic groups is widely disparate. They are 67.5 percent Southern Min, 13.6 percent Hakka, 7.1 percent Mainlanders, 3.34 percent New Immigrants/New Residents, and 2.23 percent aborigines (Council for Hakka Affairs, 2011; Ministry of the Interior, 2011; Ministry of Education, 2011). The group of New Immigrant/New Resident who are mainly from the Southeast Asia has emerged in recent fifteen years and has become the fifth ethnic group in Taiwan. Its population is even beyond the aboriginal group now.

Different ethnic groups have their own religion belief systems. Religion is a key element as ethnic identity along with other elements based on the theory of primordial/essential identity (Shih, 1998). The people of major five racial/ethnic groups in Taiwan belong to different religion belief systems. These include traditional folk beliefs, Buddhism, Taoism, Confucianism, Christian/Catholicism, Islam, aboriginal natural beliefs, and others.

It has been recognized that the introduction of multicultural education into Taiwan is more than 20 years since 1993 (Huang, 2014). Within the past 20 years, lots of academic works and researches on multicultural education had been done in Taiwan. However, more are mainly focused on the racial/ethnic, class, and gender issues. The situation of academic research is so, not to mention the textbooks and teaching in k-12 schools. To acknowledge religious diversity and tolerance is also an important aspect needed to be stressed to cultivate citizenship and achieve education social justice, in addition to ethnic, class, gender, and other aspects in a multicultural society.

It is important to know what, how, and why the religion issues are presented in school textbooks, as well as teachers' and experts' perspectives on them. The major purpose of this study was going to investigate what kinds and in what degree of religious diversity, religious tolerance, and religious

imbalance embedded in textbooks of junior-high schools in Taiwan, as well as how teachers' and experts' interpretations are.

The theoretical concepts and framework in this study were derived primarily from the thinking of Stovall (2009, 2010, 2013), Hollins (2008), Gay (2010) and Banks (2009). Stovall's theory on social justice education, Hollins' on transforming professional practice, Gay's on culturally responsive teaching, and Banks' on multicultural education have all shed some light on the study.

## 2. Methods

The research adopted qualitative approach to collect data. Data derived from literature review, content analysis, individual interview, and focus group interview provided significant information to answer the related research questions. Three commercial versions (Nanyi 2014, Hanlin 2014, Kanghsuan 2014) of Mandarin and history textbooks of junior-high school in Taiwan, 36 volumes in total, were included to be analyzed. The analysis unit used for text is "lesson/chapter" under the consideration of comparison between different versions and subjects on the issues of religious diversity, tolerance and prejudice. There are 210 lessons of Mandarin and 102 chapters of history included for analysis. Besides, each individual picture screen is regarded as a unit for analysis. The analysis issues include four categories: "distribution of religions (factions)," "religious elements," "multi-religious core values," and "multi-religious education literacy."

For interviews, six teachers of junior-high school were invited to participate the focus group interview, and six religion experts from areas of religious studies, anthropology, Chinese literature, and history were participants of the individual interview.

## 3. Results

Integration of data from textbook content analysis, individual interview, and focus group interview, five major research findings include the following.

### 3.1. Religious diversity more or less showed in Mandarin and history textbooks

In terms of quantity, the religion issues of Mandarin textbooks showed on six lessons in Nanyi (N) version, nine lessons in Hanlin (H) version, and 23 lessons in Kanghsuan (K) version. K version is obviously higher than the other two versions on the appearance number of religion issues. The three religious categories that appeared in N version of Mandarin textbooks are Christianity, natural gods of faith, and folk religion in order; the six in H version are Buddhism, Christianity, folk religion, Hinduism, natural gods of faith, and Taoism in order; and the six in K version are Buddhism, natural gods of faith, Christianity, folk religion, Shinto, and Islamic in order. H and K versions of Mandarin textbooks are obviously more diverse than N version on the category of "distribution of religions (factions)." In terms of the amount and type of religion, K version of Mandarin textbooks is obviously more prominent than N and H versions.

In history textbooks, the religion issues showed on 23 chapters in N version, 21 chapters in H version, and 26 chapters in K version. K version is a little bit higher than the other two versions on the appearance number of religion issues. The distribution of religious categories showed on the three versions of history textbooks are almost the same, around 12 categories. The top five in N version are Christianity, folk religion, natural gods of faith, Islamic and Buddhism in order; the top five in H version are Christianity, folk religion, natural gods of faith, Islamic, and Buddhism in order; the top five in K version are Christianity, folk religion, natural gods of faith, Taoism, Islamic in order, and Buddhism is the sixth. In terms of the amount and type of religion, the three versions of history textbooks are nearly no significant difference.

The religion issues on the three different versions of Mandarin and history textbooks of junior-high school in Taiwan, in general, more or less showed religious diversity on the distribution of religions (factions). However, the presentation of history textbooks which involved "objective" historical knowledge presented more religion diversity than Mandarin textbooks which covered mainly selected Chinese and Taiwanese literature works.

### 3.2. Religious presentation founded imbalance and preference in Mandarin and history textbooks

The Mandarin textbooks especially showed imbalance on the distribution of religious categories. In other words, Mandarin textbooks seem to be embedded a tendency of having preference for local religions of Buddhism, Taoism, Confucianism and traditional folk beliefs, or viewing Christianity in

Europe and the United States as the only main world religion outside of Taiwan. In the 210 lessons of three versions (70 lessons individually), Islam, Hinduism, Shinto were mentioned only one time in one version.

The history textbooks that based on the “objective” historical facts showed more balance on the distribution of religion presentation, but the narrative way is more like a preference for political history perspective rather than a perspective from history of culture and religion.

### **3.3. The appearance of four religious elements**

There are four religious elements including in the textbook analysis, sacred people/thing/object (S), doctrine (D), ritual (R), and religious organization (O). In Mandarin textbooks, the N and H versions only mentioned elements of sacred people/thing/object and ritual, while the K version also referred a few concepts of religious organization and doctrine.

In history textbooks, the appearance of sacred people/thing/object is the top one, and religious organization followed after in the three versions. It is interestingly found out that element of ritual appeared more than doctrine in the history of Taiwan and the history of China, while doctrine appeared more than ritual in the world history. The appearance of sacred people/thing/object is the top one no matter in history or Mandarin textbooks.

### **3.4. Presentation way of “multi-religious core values” in history textbooks**

The multi-religious core values include religious diversity, religious tolerance, religious freedom, and religious neutrality in this analysis. Only five lessons of selected Chinese and Taiwanese literature works in three versions of Mandarin textbooks mentioned multiple religions, but not intended to promote the ideal of religious diversity. The other values of religious tolerance, freedom, and neutrality never appeared.

Some chapters in the 3-5 volumes (history of Chinese, and world history) of three versions history textbooks mentioned core values of religious diversity, tolerance, freedom, and neutrality, especially on diversity and tolerance. However, religious diversity was presented on the fact of multiple different religions, but not intended to promote the ideal of religious diversity. The value of religious tolerance showed up with negative situations or cases, referring to religious conflicts and contradictions, showing religious “intolerance.” The other values of religious freedom and neutrality not being mentioned much, but also faced the same problem with religious tolerance, being presented by negative cases.

### **3.5. Almost no appearance of “multi-religious education literacy” in both history and Mandarin textbooks**

Multi-religious education literacy emphasized four domains of cognition, affection, transformation, and action skill. They include recognizing religious diversity and differences (cognition), respecting and tolerating different believers (affection/attitude), critically reflecting on religious prejudice and discrimination (transformation), and putting into social action (action skills). However, the four domains of multi-religious education literacy almost have no appearance in both history and Mandarin textbooks. They had presented some different religions on the same Mandarin lessons and history chapters, but that is not equal to the ideal of promotion religious diversity or recognizing religious differences.

## **4. Conclusions**

### **4.1. Keep balance between religious localization and globalization**

The top five religions in the world are Christianity (31.4%), Islamic (23.2%), Hinduism (15%), Buddhism (7.1%), and folk religion (5.9%), as well as 16.4% of atheism (Pew Research Center, 2015). The top five religions in Taiwan are folk religion (45%), Buddhism (20%), Christianity (7%), Islamic (0.5%), as well as 14.% of atheism (Ministry of the Interior, 2015). The orders of top five religions are quite different between Taiwan and the world. The history textbooks that presented the “objective” historical facts showed more balance on the distribution of local and world religion presentation. The Mandarin textbooks that covered mainly selected Chinese and Taiwanese literature works showed the preference for the local religions in H and K versions, and for Christianity in N version.

It is important to keep asking that whose preference and perspective showed on the textbooks, editor’s, the audience’s or the politician’s. No matter whose, none of them should be the subjectivity of textbook and education, but student’s learning needs. We need to cultivate our students with a world view

and local identity. It is important to keep balance between localization and globalization on the issue of multi-religion or religious diversity for the future global citizens.

#### **4.2. Political perspective stronger than the perspective of cultural Exchange**

It is good to know the history textbooks have a better balance on the presentation of local and world religions. However, the narrative way on the textbooks is more like a political history perspective rather than a perspective from history of culture and religion. Worse of, the presentation of religion is almost attached to political events, such as religious wars, religious conflicts, and religious reform in the world history, and its negative is far greater than the positive.

Even a few “positive” cases on the east-west cultural exchange events in the history of Taiwan and the history of China, they all about the missions of the western Christian missionary, such as “George Leslie Mackay spreaded Christianity in northern Taiwan through medical and education,” “James Laidlaw Maxwell spreaded Christianity in southern Taiwan Through medical,” and “Matteo Ricci tried to allow Chinese believers to worship their ancestors, but the Roman Catholic Church did not recognize it.” It is necessary to further ask whether the “objective” historical knowledge presented on history textbooks is objective enough or not, and whose preference and perspective showed on the textbooks, editor’s, the audience’s or the politician’s.

#### **4.3. Facing up the religious diversity of student composition in a changing society**

The subjectivity of textbook and education should be student’s learning needs rather than the other. In the past 15 years, more and more children of the New Residents in Taiwan have entered the school with their family religion from the Southeast Asia, mainly Islam. The Taiwanese students who are not familiar with Islam are curious about them and easily step on “religious landmines” to create conflict for their religious ignorance and disrespect.

We need to face the diverse population of students and the situation of religious diversity at schools in a changing society. It is important to teach students about different ethnic groups and their diverse cultures and religions via teaching and learning activity that related to their live experiences. Textbook is a imperative learning media and resource at school, and every student depends much on textbooks for school learning in Taiwan. We need to ensure that the knowledge in the textbooks reflects the correct knowledge content, students' live experiences, and global trends.

#### **4.4. Empowering teacher’s multicultural competence**

Based on the facts of diversity of student composition in a changing society and the shortcomings of history and Mandarin textbooks in Taiwan, it is in a critical time to empower teachers’ professional development on multi-religious knowledge and literacy. Textbooks have been treated as an important resource for students’ learning and teachers’ teaching in Taiwan. However, students are the global citizens of future hope rather than just a test machine that rigidly adhere to the textbooks. And teachers should play a key role in the transformative intellectuals but not a curriculum hostage without teaching soul.

We need to provide teachers with opportunities to empower their multicultural competence on the issue of multi-religions. These may include university programs, pre-service courses of teacher education, in-service teacher workshops, lesson plans for contest, excellent lesson plans open to internet, and related supplementary materials compilation (such as multi-religious knowledge of the world). All these are a long-term commitment. Once teachers get empowerment for themselves, they can further enhance students' multi-religious knowledge, respect, and tolerance, as well as to hopefully reduce students' religious prejudice and discrimination.

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## EXPLORING THE TRANSITIONAL EXPERIENCE OF BTEC STUDENTS FROM POST-16 STUDY INTO AN UNDERGRADUATE DEGREE

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### Abstract

In England, the number of learners taking technical qualifications at post-16 study has increased over the past decade. Recent data (UCAS, 2015) shows a sharp rise in the number of people applying to university with qualifications like BTECs (vocational equivalent to A-level) which allow progression from a technical track at post-16 to an academic track at HE, within some academic institutions. Research has highlighted differential outcomes for BTEC students at HE, suggesting that students who go to university with BTEC qualifications are less likely to achieve a first or an upper-second class degree; and that this difference is more pronounced in research-intensive universities. Research also suggests a ‘nuanced picture’ whereby such students ‘can feel more independent, self-motivated and capable than their counterparts with A-level qualifications’ (Masardo and Shields 2015).

This paper reports on a case study of a sample of BTEC students at a Russell Group University. The study seeks to understand how BTEC students engage with the university educational experience and focuses on the transitional experience of BTEC students starting their undergraduate degree; how the knowledge and skills achieved through their BTEC qualification enables, or otherwise, their degree level learning; and the nature of students’ progression routes from BTEC, through university and into the workplace. Through a series of face-to-face semi-structured interviews with students at different points in their university experience, data was elicited which illuminates students’ perceptions and experiences.

This study forms the basis of a wider study to be conducted by four HE institutions in England in collaboration with FE Colleges. The research aims to develop evidence-based interventions to transform the transition of BTEC students into HE as a means of reducing differential educational outcomes and contributing to the Government widening participating agenda.

**Keywords:** *BTEC, HE, Vocational, Transition, Technical.*

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### 1. Introduction and Background

This paper presents emerging findings from a case study conducted by Pearson UK and a Russell Group University<sup>1</sup> that aims to explore the transitional experience of BTEC students as they progress out of post-16 study into an undergraduate degree. The study is conducted in the context of vocational provision for post-16 learners in England that provides a route of progression to Higher Education.

Pearson BTEC qualifications are technical and applied qualifications that have been established for 30 years. They are developed in collaboration with industry representatives and provide a respected route both directly into employment, and to further and higher education (FE and HE). This study focuses on BTEC Nationals which are UK Level 3 (EQF Level 4) qualifications typically taken by learners aged 16-19 in post-16 settings. BTEC Nationals are designed to be equivalent in level and status to A-levels (Academic qualifications for 16-18 year olds designed primarily for progression to HE). The BTEC National qualifications allow progression from a technical track at post-16 to an academic track at HE, within some HEIs. Recent data (UCAS, 2015) shows a sharp rise in the number of people applying to university with qualifications like BTECs, with approximately one fifth (16.68%) of those accepted onto undergraduate degree programmes comprising students possessing only BTEC qualifications.

A key differentiating factor between the Technical Vocational Education and Training (TVET) system in England and those in other countries appears to be the age groups at which young people are guided towards a technical track. For instance, in Switzerland and the Netherlands, young people are guided towards VET at age 14 or 15, as part of a planned future of training leading to an occupation. In England, qualifications of a similar subject matter may be offered several times at different ages and

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<sup>1</sup>The Russell Group represents 24 leading UK universities which are committed to maintaining the very best research, an outstanding teaching and learning experience and unrivalled links with business and the public sector.

stages of education (pre- and post-16), and as an Apprenticeship (Pearson, 2013). There is therefore a difficulty in comparing technical provision in different countries given that BTEC National qualifications are classed as technical but accepted as equivalent to A-level for HE entry, suggesting that the experience of young people in England following a technical route, may differ considerably from the Apprenticeship and workplace challenges faced by a 14-year-old in Germany. The emphasis on 'equivalency' with A-level, rather than on the intrinsic value of alternative qualifications, makes it difficult for education institutions and learners to distinguish truly valuable routes to employment, or further and higher education. England is not alone in regarding the general academic track as having the higher status. For example, in Germany and Switzerland where there are very established VET tracks, the academic track is still considered to be the 'gold standard' (Pearson, 2013). This presents interesting challenges for both students and HE institutions (HEIs).

Many students with BTEC qualifications are successful at university, particularly where their BTEC subject is closely aligned with their chosen undergraduate degree. Course assessors in various HEIs believe that those coming to university with technical qualifications such as BTEC Nationals are stronger in areas such as team-working, independent learning and application of learning to real-life problems; but weaker in areas such as evaluation, synthesis, numeracy and written skills (FreshMinds, 2011). Furthermore, these learners typically have less experience in examined assessments and certainly where 'universities assume these students have experienced an A-level style of teaching and assessment, the students may struggle' (UCAS, 2016). Research conducted by Masardo and Shields (2015) highlighted differential outcomes for BTEC students at HE (when compared to their A-level counterparts), suggesting that students who go to university with BTEC qualifications are less likely to achieve a first or an upper-second class degree; and that this difference may be more pronounced in research-intensive universities. This same research also suggests a more 'nuanced picture' whereby such students 'can feel more independent, self-motivated and capable than their counterparts with A-level qualifications' (Masardo and Shields, 2015).

It is therefore important to better understand the complex mechanisms and attitudes that inform the research results relating to differential outcomes, particularly how students transition from BTEC post-16 study into formal university courses and how they progress them. At a time when the proportion of young people with BTEC qualifications at level 3 is increasing, and universities are facing a continuing falling demographic of 18 year olds that will continue until 2020 (ASCL, 2009), there is a need for HEIs to understand how they attract, retain and better support students entering HE from a technical track.

## 2. Research aims and questions

Using a case study approach, this study aims to understand how BTEC students progress from post-16 study into a Russell Group university and how they access and engage with the university educational experience. This paper reports briefly on the following two research questions:

1. What is the nature of learners' access to and experience of the transition from BTEC into degree programmes?
2. How do the knowledge and skills achieved through the BTEC qualification enable, or otherwise, their degree level learning?

## 3. Design and Methodology

This one year case study focuses primarily on the experiences of first year students on two undergraduate degree programmes; Sport Science and Drama. These were selected as they were the two undergraduate programmes identified by the university as having the highest number of BTEC students. For comparison purposes, students were recruited from three main cohort groups (BTEC; A-levels; and BTEC combined with A-levels) to provide insight as to whether there were differences or similarities between those students who entered university with BTEC qualifications and those who held A-levels.

Two further cohorts of students were included in the sample to get the reflections and views of students with BTEC qualifications in the second and third years of undergraduate study. These students included those studying Drama, Sport Science and was also extended to Business Management undergraduates. First year students were interviewed just before they commenced their undergraduate degree (Pre-entry), during their first term of study and are due to be interviewed again in their third term of study. Second and third year students were interviewed in the second term of their respective years. Table 1 shows the number of interviews conducted for each cohort (to date), broken down by undergraduate degree programme.

Table 1. Student participant sample.

|                                      | Drama | Sport Science | Business Studies |
|--------------------------------------|-------|---------------|------------------|
| Year 1 Pre-entry <sup>2</sup> (BTEC) | 4     | 8             | N/A              |
| Year 1 First Term (BTEC and A-level) | 13    | 19            | N/A              |
| Year 2 and 3 Second Term (BTEC)      | 8     | 23            | 12               |

Semi-structured, face-to-face interviews were used to elicit students' perceptions and experiences. The interviews typically lasted 45 minutes<sup>3</sup> and all interviews were recorded (with participant consent) and subsequently transcribed for analysis purposes. The study was approved by the University's Ethics Committee and all student data was kept confidential and anonymised at the point of analysis. In addition to the student interviews, a small number of lecturers and employers will be interviewed to gather their perceptions. Quantitative data will also be gathered in the form of descriptive statistics to include, for example: age; UCAS tariff score; parental occupations; and Academic progression data. Neither data set is included within the scope of this paper.<sup>4</sup>

#### 4. Emerging high-level findings

At the time of writing, full analysis of the data has not been completed and so this paper focuses on some emerging high-level themes<sup>5</sup> from three main areas: 'Soft skills' and structure of BTECs; core content and skills; and academic reading and essay skills.

In general, there was consensus among participants that university learning is a big step up from BTEC learning, either through new, or more in-depth, learning of content already covered in their BTEC studies. For most participants, they felt they had a good foundation from which to build. Certainly, at the pre-entry stage there a high degree of self-reported confidence around how the BTEC had prepared them for university learning, particularly in the 'soft skill' areas.

Participants generally felt that the BTEC structure and skills-based, active or discovery learning approaches (as opposed to a focus on more traditional knowledge acquisition) prepares them well for university learning. Students specifically mentioned communication skills, teamwork, and more practical learning. A number of the participants felt that their BTEC studies had helped to cultivate an independent approach to their learning enabling them to manage their own learning, thereby preparing them well for university. A first year Drama student who had followed a mixed programme of study at post-16 (A-levels with a BTEC) talked about how the BTEC had better prepared them (when compared to A-level) for the independent learning requirements at university:

*I'd say for my A-level in Drama like, I got a lot more guidance and help, whereas with my BTEC it was a lot more independent, so that was similar to sort of what we do here at university.*

Students, overall, thought that the assignment model with the regular need to be assessed on their learning, combined with longer-term projects that are typical with BTECs, were good preparation for university learning. Furthermore, many thought that the deadline management skills developed through the BTEC were useful for university. Interestingly, one of the A-level students alluded to the strength of BTEC in this area, stating that their BTEC counterparts were accustomed to a 'learn and revise as you go along' approach rather than a 'revise at the end' approach typical for A-level (Year 2 Sport Science, A-level). Their view was that the BTEC approach was much more aligned with the approach at university.

Across both the Sport Science and Drama cohorts, participants thought that the core content of their BTEC was directly relevant to their degree programme. For example, those undertaking a Sport Science degree specifically mentioned the anatomy and psychology aspects of the course that they felt they had a solid foundation in. Drama students (particularly Year 2 and 3 undergraduates) emphasised that they thought the BTEC in Performing Arts had prepared them particularly well for the performance-based aspects of their undergraduate degree, placing them at a potential advantage over their A-level counterparts.

Unsurprisingly, students, in general, thought that A-levels prepared students better for the theory-based elements of their degree programme. A common theme amongst both the Sport Science and Business (Year 2 and Year 3) cohorts was that whilst there was a good foundation in the core knowledge and content areas, there was a perceived gap related to the mathematical and statistical skills required for their university courses. Many mentioned that they had struggled with the mathematical components and felt that their BTEC had thus not prepared them adequately in this area.

<sup>2</sup>The pre-entry cohort were interviewed again in their first term and so are counted again in the 'Year 1 First Term' figures.

<sup>3</sup>Interviews with pre-entry students were conducted over the phone and lasted approximately 20-30 minutes in duration.

<sup>4</sup>All data collection is due to be completed by June/July 2017.

<sup>5</sup>The intention of this paper is not to cover the findings in great detail.. A full report is due to be completed towards the end of 2017.

Two further areas of perceived ‘weakness’ of the BTEC in relation to preparation for university learning were examinations and academic reading and essay writing. Whilst some participants felt that their BTEC assignments had given them some experience of ‘essay’ writing, for most, the difference between this and writing an academic essay with a coherent structure that demonstrates critical thinking and contains appropriate referencing, was significant. Indeed, there were many instances where participants spoke of the struggle with the volume and demands of the academic reading and essay writing. Those with experience of A-levels thought that they had prepared them much better for the academic essays and exams they were experiencing at University, particularly those students who had completed ‘essay-based’ subjects at A-level, for example, English and Psychology. It is worth noting however, that even for those students who had experience of these ‘essay-based’ A-levels, they still felt that it was a significant step up in terms of the expectations placed on them at university:

*And I'd say they are a lot more sort of academic than what we would be writing at school... So I'd say the essays are definitely more intense here (First year Drama, A-level and BTEC).*

Overall, students felt that BTEC was not good preparation for the examined components at university.<sup>6</sup> They felt much more comfortable with the coursework aspects and some even chose modules based on how many exams they would have to take. However, despite the lack of preparation and the perceived struggle with exams, most of BTEC participants interviewed (across all year groups) felt they had performed reasonably well in their undergraduate exams.

## 5. Discussion and Implications

The emerging findings support the idea of a ‘nuanced’ picture described by Masardo and Shield (2015). Certainly there are some areas where students with BTEC qualifications self-report weaknesses linked to their chosen undergraduate degree, for example, core mathematics (and statistics); exam preparation; and academic essays. However, there are also many areas where they self-report high-levels of confidence and even some that they consider to be an advantage over their A-level counterparts. These are particularly related to so-called ‘soft-skills’, for example, teamwork; communication; and more practical learning. Furthermore, these students report having developed a strong sense of independent learning through their BTEC studies that they believe equips them with the ability to manage their own learning – critical skills to being able to thrive at university and beyond. Indeed it is widely reported that these ‘soft-skills’ are exactly the kind of skills that are highly valued by employers (eg. Clark et al., 2016). Moreover, it is important to understand that the ‘nuanced’ picture also needs to be understood in the context of different subject areas - the success of undergraduates in their chosen degree who have come via a technical route, can depend greatly on the subject they pursue and how similar their undergraduate degree programme is in relation to their BTEC qualification (UCAS, 2016).

The emerging findings also support the view that to be able to better understand these students who enter HE with BTEC qualifications, it is important to recognise the differences between students who follow an academic track compared to those who follow a technical track. Often these differences are considered as negative towards BTEC, particularly in areas where BTEC students are perceived to be weaker than their A-level counterparts. This is not helped by A-levels being held up as the ‘gold standard’ and a quasi-obsession with comparing A-levels directly with BTECs. The A-level and BTEC routes offer very different learning approaches that result in the development of very different skills and strengths (UCAS, 2016). There is a need to avoid referring a ‘deficit model’ in relation to technical qualifications such as BTEC. Alternatively, it should be recognised that ‘students bring a wide range of different experiences and learning abilities to their higher education studies, and that all of these abilities can be useful in helping them to succeed’ (Masardo and Shields, 2005).

The emphasis and value placed on an academic track over a technical track is evident across a range of stakeholders, parents included. Research has revealed that parents continue to view academic education as more valuable in terms of the quality of education and the prospects of going to a good university. Yet fewer think that an academic track provides better employment opportunities. There is a social dimension to this, as higher income families are more likely to value an academic route more highly (Richards, 2016). BTEC qualifications offer students from a wider participation background the opportunity to enter HE (WVPC, 2014) and this social dimension merits further attention. Furthermore, government reforms that changed higher education funding and finance, ‘have created a dramatic rise in student fees and associated levels of debt, particularly in England, which has increased the financial risk associated with higher education studies. Students with lower degree outcomes that may result in reduced

<sup>6</sup>The BTEC Nationals (QCF) taken by these students contained no external assessment. Pearson have re-developed their entire suite of BTEC Nationals in response to policy changes and feedback from HE and employers. These RQF BTEC Nationals for first teaching 2016/17 contain compulsory externally examined components and increased mathematical content where appropriate.

labour market value, will still accrue large amounts of debt that will last most of their working lives' (Masardo and Shields, 2015).

HEIs cannot therefore ignore the fact that there are increasing numbers of students with BTECs pursuing an HE route and that these students have different strengths and experiences to those with academic backgrounds. HEIs thus have a responsibility to try and bridge the gap in outcomes obtained by students following a technical track by understanding the motivations, experiences and strengths of their different students. It is also worth addressing the expectations of BTEC students as they transition from their post-16 studies to university. Existing literature highlights the importance of mindset and attitudes and how this can affect whether or not students make the most of their university experience how they can impact aspirations (HEFCE, 2017). A perceived stigma towards BTECs was reported by some of the participants in this study with some saying that this had resulted in feeling nervous about their undergraduate course and questioned their ability to cope. Although those who expressed these anxieties for the most part felt that their initial fears about being behind, or being stigmatised, were unfounded; this still merits further exploration.

There are currently various initiatives taking place within UK HEIs (many in partnership with local FE colleges) which attempt to deal with this issue directly. This study for example, forms the basis of a wider study to be conducted by four HE institutions in England in collaboration with four FE Colleges. The research aims to develop evidence-based interventions to transform the transition of BTEC students into HE as a means of reducing differential educational outcomes and contributing to the Government commitment to increase the number of disadvantaged young people entering HE.

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## **THE EFFECT OF USING METACOGNITIVE STRATEGIES FOR SOLVING MATHEMATICAL WORD PROBLEMS**

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### **Abstract**

The purpose of this study was to identify the effect of using metacognitive strategies on word problem solving on fifth grade students' achievement. Participants were (N=133) Albanian speaking Kosovar students of fifth grade from two urban schools. A twelve-word problem tasks test was constructed in two versions. The items involved mathematical word problems which can be solved using one arithmetic operation, word problems with information which are not in consistence with an arithmetic operation and the other items were more complex consisting of two or more necessary steps with a mix of arithmetic operations. Test was applied twice, as a pre-test or baseline, and posttest. During one month, about half of students received metacognitive instruction and self-regulation strategies based on the work of Maverech and Kramarski (1997) and Montague (2008), while the other students studied under the traditional method. After a month, the posttest was administrated to both groups. The findings indicate that there was an effect of metacognitive instruction and self-regulation strategies in the experimental group. The authors discuss implications for future research and practice.

**Keywords:** *Mathematics, word problems, metacognition, self-regulation.*

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### **1. Introduction**

Word problems have a significant importance in textbooks and states' assessments, thus they are included in almost all curriculum of mathematics. According to the Kosovo Curriculum Framework (CFK, 2011), 'applied knowledge in the context of problem solving through appropriate actions, is one of the learning outcomes that students need to achieve in all levels'. While, the key attention in the Programme for International Student Assessment (PISA) is specifically examining students' skills in dealing with problem solving of everyday life OECD (2014). Mathematical word problems have received a lot of attention in educational literature because this issue is considered to be one of the most difficult in math classes and because word problems help students apply formal mathematical knowledge and skills to real world situations. (Hegarty, Mayer, & Monk, 1995; Swanson, Lussier & Orosco, 2015).

Several studies have identified some of the sources of these difficulties, most of them associated with the semantic structure of the problem presentation, which indirectly affect more reading comprehension that understanding itself mathematical problems (Hegarty et al, 1995; Haylock and Thangata, 2007). One of these sources of difficulty are "keywords" used in word problems (Hegarty et al., 1995; Maverech and Kramarski, 1999). Most students rely on mathematical keywords, assuming that they always pose a "significant" information about mathematical operations. Consequently, these students interpret (incorrectly) the words "more" or "magnified" as always present adding, while "less" or "less than" as subtracting; "quotient" or "product of" as multiplication and "to" or "from" as division (Maverech, Terlieltaub, Vinberger and Nevet, 2010). They base their solution plan on numbers and keywords that they select from the problem (Vula and Berdynaj, 2011) without understanding what each number represents in the problem.

A word problem solution is a complex cognitive domain involving the application of several kinds of knowledge. It is a process that requires to apply the metacognitive learning and self-regulation strategies. These active and constructive processes make students set goals for their learning and then monitor and control their problem-solving process (Stoeger, Fleischmann and Obergruesser, 2015). Word problem solving presents the foundation of all mathematical activities (Van de Walle, 2004). The process of solving the word problems requires students to use the linguistic information, identify missing information and derive the calculation problems. It engages students to be ready for identifying the unknowns, constructing the mathematical expressions, explaining and justify their mathematical

reasoning and developing their mathematical knowledge through exploration (Pape & Smith, 2002). The word problems are critical for helping children connect different word meanings, interpretations, relationships to mathematical operations and real life problems (Van de Walle, 2004). By linking the words with informal calculation, they can clearly see the connections between the concepts and their application. Therefore, word problems not only serve as a basis for understanding children's strategies for solving addition, subtraction, multiplication, and division problems, but they can also provide a unifying framework for thinking about problem solving in their daily life (Barmby, 2009).

Mathematical educational research and educational psychology studies have focused on finding the appropriate instructions for students with mathematical disabilities or for students in mixed ability classrooms (Jitendra et al, 2007; Fuchs, Seethaler, Powell, Fuchs, Hamlett and Fletcher, 2008; Xin, Wiles and Lin, 2008; Montague, Wagner and Morgan, 2000; Zhu, 2015). Many studies were mainly focused on the schema knowledge and on the basis of contemporary literature in educational psychology. They show that schema-based instruction increases students' problem-solving performance (Fuchs & Fuchs, 2004, 2005; Finelli, Courey, & Hamlett, 2004, Flores, Hinton and Burton, 2016). Other studies have found a strong relationship between vocabulary and reading comprehension as a key component in understanding mathematics (Montague et al. 2000; Österholm, 2006).

Taking into account the importance of the process of word problems solving, teachers as facilitators should help children build their world view associated with mathematical problems, and the relationships between various factors. They should help students make connections between language, problem solving processes and mathematical connections (Jitendra et al., 2007). This study aimed to investigate if the meta-cognitive instructional method and self-regulation strategies, has an impact on improving student's ability to solve math word problems.

## 2. Methodology

### 2.1. Participants

The study involved 133 students of two elementary schools in Prishtina, capital of Kosovo with average age of 127 month (SD 3.29 month). There were four classes randomly selected in both schools, two were experimental group and two control group. From the total number of students 60 (45.1%) belonged to experimental group whereas 73 (54.9%) were control group. All the students were Albanian speaking, and they had not any difficulties or disorders reported by their teachers.

### 2.2. Materials

Due to measure the impact of instruction based on metacognitive strategies on students' performance for word problem solving, a 12- item test was used. In this test, there were represented four of the arithmetic operations addition, subtraction, multiplication and division.

The structure of the test was based in the curricula for mathematical teaching in the fifth grade.

From 12 word problems constructed four items used only one arithmetic operation (WPG1: items, 1-4), four items require to focus on information which was not in consistence with an arithmetic operation (WPG2: items, 5-8) and the rest (WPG3 items, 9-12) involved two or more operation/steps necessary to obtain the solution.

There were two versions of the test, pre-and post, with an identical structure but varied in using different quantities and stories. Examples of word problem types are shown in the Table 1.

*Table 1. Examples of the word problem types used for pre- and post – tests.*

|  |   |
|--|---|
| 1. Director Toni directed a film which ran for 248 minutes. During the editing process, 109 minutes were removed. What is the final running time of the film, after editing?                         | Can be solved by one arithmetic operator (WPG1) (Items, 1-4)  |
| 2 Nita run 15 km each day. Nita ran 5 km less each day than her sister Zana ran. How far did Zana run each day?  | Word problem with information which is not in consistence with an arithmetic operation (WPG2), (Items, 5-8) |
| 3. Hana read a book with 112 pages for three days. The first day she read 29 pages, on the second day she read the twice of the first day's pages. How many pages should read Hana on the third day? | Can be solved by two or more arithmetic operations (WPG3) (Items, 9 - 12)                                   |

### 2.3. Procedure

Once the schools and classes were randomly selected a paper and pencil test was administered to all the students (pupils), which was the pre-test. Explicit instructions were given to the students before running the test. They were told “*Read carefully the task; try to understand what is being asked, then start solving. If you better understand doing schemas or any other notes, please write it down in the same paper with the task*”. In the test, enough space was given intentionally. Four teachers of the experimental classes were gathered for an oral discussion led by the first and third authors of this study. During this meeting, teachers were introduced with the metacognitive strategy they were about to apply during four weeks in their math classes. Each teacher used to apply the strategy at least 20 minutes per each math class which was five days per week, using word math problem solving.

The procedure was based on a multidimensional method of teaching and self-regulation strategies to improve the students’ problem solving ability (Mevarech & Kramarski, 1997; Montague, Wagner, & Morgan, 2000). Whereas, Mevarech and Komarski’s (1997) method involved three interdependent components: metacognitive processes, cooperative learning and the provision of feedback-corrective-enrichment, we noticed that our students tended to work better in peer learning, so this new strategy was considered. Teachers of experimental group during four weeks, in their math classes have used teaching strategies based mainly on meta-cognitive questions such as, (a) *Comprehension* (What is the problem all about?); (b) *Connection* (In what way is the problem at hand similar to or different from problems you have solved in the past?); (c) *Strategies* (Which strategies are appropriate for solving the problem?) and (d) *Reflection* (Does the solution make sense?).

After each answer, students checked their performance using the self-regulation question: *Is my answer correct? Is everything okay? If not, go back and ask for help if needed.* Cronbach Alpha reliability for the pre- and post-test was 0.737 and 0.786 respectively.

*Scoring:* The maximum scores were 24 points, each item was scored as 2 points (the final answer and the process were correct), 1 point (the process was correct but there was a computation error) or 0 point (solution process and answer was incorrect).

### 3. Results

Table 2 shows the basic statistics about the pre-and post-test results of the experimental and control groups.

Table 2. Mean scores and standard deviations on total scores, WG1, WG2 and WG3 by time (pre- and post-tests and treatment).

|                  | Experimental Group |              |               |              | Control Group    |              |               |       |              |
|------------------|--------------------|--------------|---------------|--------------|------------------|--------------|---------------|-------|--------------|
|                  | WP1<br>(1-4)       | WP2<br>(5-8) | WP3<br>(9-12) | Total        | WP1<br>(1-4)     | WP2<br>(5-8) | WP3<br>(9-12) | Total |              |
| <b>Pre-test</b>  |                    |              |               |              | <b>Pre-test</b>  |              |               |       |              |
| Mean             | 4.25               | 3.18         | 2.07          | <b>9.50</b>  | Mean             | 4.93         | 3.21          | 1.92  | <b>10.05</b> |
| SD               | 2.38               | 2.28         | 1.79          | 5.33         | SD               | 1.84         | 1.94          | 1.63  | 4.20         |
| <b>Post-test</b> |                    |              |               |              | <b>Post-test</b> |              |               |       |              |
| Mean             | 5.05               | 5.85         | 4.33          | <b>15.23</b> | Mean             | 4.63         | 4.66          | 3.37  | <b>12.66</b> |
| SD               | 2.39               | 2.12         | 2.40          | 5.91         | SD               | 1.62         | 2.23          | 2.28  | 5.07         |

In order to verify the hypothesis of this study, analysis of covariance (ANCOVA) was performed.

The post-test total scores, word problems which can be solved by one arithmetic operation, word problem with information that is not consistent with arithmetic operations and word problems which can be solved with two or more arithmetic operations were separately analyzed using ANCOVA design with the respectively pre-test as a covariance in each analysis.

Table 3 summarizes the ANCOVA findings for total post-test scores and for total scores for each group of word problems.

Table 3. Summary finding with ANCOVA.

| Source       | df | F           |        |         |       |
|--------------|----|-------------|--------|---------|-------|
|              |    | Total score | WPG1   | WPG2    | WPG3  |
| Intervention | 1  | 20.548***   | 4.539* | 12.23** | 6.28* |

\*\*\* p<0.001 \*\*\*, p< 0.01, \*p<0.05

The results show that students are more likely to benefit from metacognitive instruction and self-regulation strategies on more complex word problem solving than in simpler word problems.

#### 4. Discussion and conclusions

The purpose of this study was to investigate whether the instruction based on metacognitive strategies have any impact on word problem solving. It was shown that, students who over a period of one month received instructions based on metacognitive and self-regulation strategies on how to deal with a word problem, achieved higher scores than students who did not have such intervention. This conclusion supports the former studies which indicated that effective use of instruction based on metacognitive and self-regulation strategies improve student's ability on word problem solving (Fuchs, et al, 2004; Ozsoy and Ataman, 2009, Montague et al. 2000, Mevarech et al. 2010).

The results of this research indicate that fifth grade students performed better at solving word problems with information that is not consistent with arithmetic operation. This supports the conclusions deriving from the research of Mevarech et.al. (2010), who stressed the importance of meta-cognitive instruction on word problems. During the experiment in this study, students were more focused on word problems with information which was not consistent with the arithmetic operation as well as on higher complexity problems in which more steps are required for problem solving. This might be the reason why the performance of students in the pre- and post-test was almost equal on the first group of problems even though the one arithmetic operation word problems were easier to solve.

Why the fifth grades students did not benefit more from the instruction based on metacognitive and self-regulation strategies? The reason for this may be related to the learning materials used during the intervention in the experimental classes. The learning materials contained a large percentage of challenging word problems as well metacognitive questions which require mathematical thinking and as such were unusual for them. Secondly, students were rarely faced with such word problem. Students are taught through the use of mathematical textbooks which reflect a limited usage of mathematical word problems. Most of the tasks for students contained in the textbooks are mainly related to computation.

Therefore, it can be argued that students need to be exposed to appropriate strategies for understanding math word problems and be engaged in practical tasks of solving those problems. Students should improve their self-regulation skills in order to express their thoughts and become successful problem solvers. This research raises several questions for further research. The relevant research questions that need specific attention include issues such as: What are the effects of the intervention based on the meta-cognitive strategies if the treatment is longer? How can the program be modified to be more effective in the future? Is there a need to adapt such interventions at all levels of primary and secondary schools?

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**FOUNDATIONS OF EDUCATION: FROM SECONDARY  
TO HIGHER EDUCATION.  
IDENTITIES AND (DES)CONTINUITIES**

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**Abstract**

In the field of Education, once again we must think and act towards the *ends* and the *purposes*, which not only fall within an alleged final step of the educational process - or an alleged final phase of the teaching/learning process - but also within the domain of *active principles, origins and causes*. In this way, we can root ourselves in concepts such as course and path, Development and new or renewed developments, innovation or continuity, involving the subjects of the action: persons, communities, peoples. What are we doing? Why and for what? Arising from Foundation of Education, Philosophy of Education and Philosophical Education, and even from values, these are the questions which can really give life to the developments, giving them meanings, significance and foundations. We will clarify the core elements - conceptual or practical principles - of "*Education for Development*" as well as "*for Growth*", in their *integral, entire and integrative sense*. This would only make sense by asking for the deep mean of Lifelong Education.

We look at the word END, and a sign of the future immediately appears, in dialogue with the present and the past. It means - the language has its weight - new and renewed human developments. For an Ecology of Human Activity in the Planet Earth, the meaning of 'Development' should be known. The plural form 'developments' pays greater attention to diversity and to "Environmental Education for Sustainability". Resources are scarce. *Carefulness* is the principle that should guide action and developments.

*What* and *how* (the object and the method of knowledge) are educationally important, but we also call for a light, a guideline, a direction, a sense. Hence the need to rethink the foundations.

From "Early childhood and Primary Education" to "Secondary and Higher Education" the bases are of the utmost importance for our (re)thinking, doing and acting in a landscape of values, attitudes, knowledge, skills and competences. Specificity, identity(ies) and connections between different cycles of studies, between different stages of/within the Education System and subsystem. What kind of people are we looking for, for what end and purpose? Will Secondary Education be a "crossroads" of the entire educational system, as UNESCO maintains in *Education for the Twenty-first Century*? What kinds of developments and persons are we preparing, to build a genuine educational society, a knowledge society? We need to combine Culture, Education and Science, to open new dynamic and meaningful horizons.

**Keywords:** *Person, Development(s), Secondary Education, Higher Education, Aims.*

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**1. Developments and perspectives on this matter**

Under the pretence of an alleged pragmatism, often we forget principles and active principles, such as the "substance" of things, realities, circumstances and projects. Without principles, however, projects and people and communities (people and communities above all) do not have origins, starts, beginnings, inception or intrinsic laws which allow the birth, the emergency, the appearance or the foundation of what makes them be what they finally will be. Even on Aristotle's view (or nearly), our time increasingly demands to reach down to the causes, the reasons and the fundamentals. What is the root of things? Why are we what we are? As persons, as communities, as peoples, who are we? Do we know our history, our biography, our *curriculum vitae*, do we know why we are here, where we are, and how we are? In Portugal, for example, or in the current European Union? Without historicism or determinism - but with historical consciousness and historicity - how can we envisage our development and our developments as a people (as each people and as peoples) - within a political reality greater than ours, as the European Union and the world are? Why we choose a given project, and not a different one?

We study our history, the history of a given place, to conceive, organize, develop and assess a given project, in a determined area – education, culture, history, architecture, landscape, heritage, customs, tourism, agriculture, farming, economy, forests, environment, etc. – or as a whole. To have a global and integrated vision, we need to know all of this. We need it if we want a sustainable development, or rather, a development in sustainability, built on an integral, entire and integrative development, on a growth able to combine all the elements of a system which is and must be, by its very nature, open and connected with other systems. The human and ecological reality is a set of open systems, lively and actively interlinked, permanently engaged in a dynamic process.

But, without any excessive anthropocentrism, everything starts with the Human Person, and tends towards him/her: a Person which is and has his/her own dignity, which needs no legal recognition (even though this recognition may constitute a useful defence to protect the human beings against their own vulnerabilities, which may be revealed by certain projects). From an anthropological and ontological point of view, the human being is weak and frail, but rarely aware of it, especially in his adulthood, unless he is facing a threshold situation, such as a serious illness. Development(s) and priorities undergo concepts of life, human being and politics as means of social organization, or as forms of legitimization and validation of a given legal order, always changeable (ideally immovable in respect of its major principles and values: “rights, freedoms and guarantees”, as we say, although even these pillars can be revised when, from a metaphysical concept, we pass to a social and political dimension). Therefore, to avoid any manipulation of the human person, I am a long-time supporter of a flesh-and-blood metaphysics, which considers as an unconditional value not only the person himself/herself, but the person in his/her own life lived, often in situations of suffering, whose must be protected. Strictly speaking, autonomy is deeper than freedom. Autonomy is, in the tradition of Kant (1724 – 1804), the ability that a subject-person owns to give himself freedom, by establishing a causal chain. We are the result of our will. According to the tradition of philosophical subjectivity – without subjectivism – individual’s autonomy is stronger and more relevant than collective freedom. Frequently the collective will is extinguished after casting the votes. For this reason, in the West, we witness a crisis of representative democracies born with the Enlightenment. What is needed, today, are new forms and new balances between representative and participatory democracies. From these dynamic combinations, other developments for people and communities will arise. “Participatory budgets” are an attempt, still very incipient, to seek an increased participation of citizens in the development of their local communities. Really, local authorities are now promoting this method – often without enthusiasm, I think – on the basis of a strategic decision, aiming at achieving results. But, as Jürgen Habermas has already warned, there is a distinction to make between a strategy aimed at ensuring a success and a strategy that seeks understanding. The latter best serves a development with discernment. Secondary Education and University should enhance and strengthen this kind of development. Continuing with our example, only a strategy aiming at understanding will be able to regenerate the democracy itself. May I point out that this matter deserves our reflexion about political theory and praxis. I do not intend to do it now, even though politics is a determining factor in communities’ development.

Let us return to the Person. As humanists, we always find in this concept the very heart of the matter, the key and the reason of all developments, of any nature whatsoever. And let us always start with Education. Still and always, we may find new contributions and developments in *Learning: The Treasure Within - Report to UNESCO of the International Commission on Education for the Twenty-first Century*, organized by Jacques Delors. In his *Introduction*, Jacques Delors writes:

“In confronting the many challenges that the future holds in store, humankind sees in education an indispensable asset in its attempt to attain the ideals of peace, freedom and social justice. As it concludes its work, the Commission affirms its belief that education has a fundamental role to play in personal and social development. [...]” (Delors, 1996, p. 11).

Below, And the Commission adds: “(...), it is essential that all people with a sense of responsibility turn their attention to both the aims and the means of education.” (Delors, 1996, p. 12). We can find here the concept of *aims* and *ends*. Strictly speaking, these *ends* are the source, and we find them at the beginning and at the end, being carried out through means that are - and must be - a part of the nature of the ends. The means used always must have the same nature of the purposes, of what is wanted with justice and justness. Thus, Education and Developments do not come to fruition. with efficacy, science and wisdom, if we do not look at the values which are their foundation, guidance and direction. Where do Education and Development (of a person and of a society) come from? And where are they headed, sharing their Being?

In the above-mentioned report “Four Pillar of Education” are referred: “Learning to know”, “Learning to do”, “Learning to live together, learning to live with others”, and “Learning to be”. This latter was the title of a book organized by Edgar Faure. The above-mentioned pillars are the foundations of formal and informal Education, from preschool to university, if said education is – as it must be – a

decent education, an integral Human Formation and an Education for Values, as increasingly needed by people, societies, institutions, nations and humankind. Otherwise, something essential would be missing, and this lack of learning and being could result in very serious consequences, causing a dangerous distortion. With a critical and reflective attitude, we must be very vigilant about training and education processes: without them there can be no development of people, societies and institutions, and irreversible damages and reversals become possible. Attending a university is not a guarantee seal, but needs to be considered a sign of commitment, obligation, quality and merit through the various dimensions of our being. The main goal is to prepare each person for a major performance in the field of human values.

The identity of Secondary Education – or Secondary-level education - is always an open matter, in terms of “regular schooling”, as we say, which also tends to integrate training experiences. There are authors who defend that general education remains the best guarantee of a solid specific professional training. Teaching is the place where pragmatism and utopia cohabit, giving rise to an environment conducive to creative and innovative dynamics, in a world that demands developments and adjustments to face uncertainties, changeable situations and multiples profiles, within a context of cultural diversity and respect for the environment. A sustainable environmental development literally allows its permanence, its durability, its nature of inheritance for future generations. It is also why our projects must contain an intrinsic and sincere ecological meaning. Future and future developments may be found only in what is unique and genuine. It is therefore necessary to see and feel every person as a unique person, every community as a unique community, nevertheless fruitfully interacting. Even in economy, the added value is created by difference and differentiated value. And it all depends on educational institution – families, schools, universities and other learning and cultural spaces. It all depends on an implicit or explicit Philosophy of Education – which brings us back to values that are intended to be transmitted, cultivated and preserved, through dialogue and respect for diversity.

Some of these aspects are deepened by Jean Marie Domenach, in his book *Ce qu'il faut enseigner*: for instance, the correlation between “singular and general”, “stability and change”, “individual and social”, “a reasonable autonomy”. He raises the question of “a humanism in tension” and, within this perspective: “classic and contemporary”, “coming back to life”, “personal expression and social learning”. He emphasizes the significance of History: “new and ancient”, “national and international”, “past, present and future”. He underlines issues as “Technology and Science”, “Culture and specialization”, “the technique in its integrity”, “scientific spirit”, stressing the meaning of values such as Civism (civility), Beauty, Philosophy. Indeed, if we don't think all these elements, within and from a Philosophy – a Philosophy of Education – as knowledge of a Wholeness (but not as a totalizing knowledge, that is its reverse), how can we conceive, structure, develop and assess Education as end and mean, fundamental to achieve development and developments? Humans developments must be supervised and, stringently, all projects and plans are human products. Even the construction of a motorway or the building of a bridge respond to human purposes that must not be forgotten, otherwise the risk exists that we forget the main thing: these infrastructures are for people, and their end should be the service of human beings. The safety of a bridge is the safety of people, and the greed of those who want to save money at the expense of quality is a clear case of undue oblivion: they forget that who must benefit from this good are persons. Every human being *per se* constitutes an END (Kant, 1724 – 1804), and must never be a means to an end. That's why the means themselves must have an anthropological and axiological aim.

Jean Marie Domenach states: “Le secondaire doit, ici aussi, se penser en relation avec les enseignements qui le prolongent. Les expériences de formation continue auxquelles j'ai participé m'ont prouvé l'étonnante fécondité de la philosophie pour des esprits qui n'y avaient pas été préparés.” (Domenach, 1989, p. 169). The author enhances the communication between different forms of knowledge – and knowledge of several natures - ideas, specialties, cultures, etc. He follows an interdisciplinary logic, the type of logic that must be promoted within a genuine *Interdisciplinary Knowledge*, in secondary schools and universities, in a dynamic relationship between attitudes, knowledge, expertise, skills, competences and values. There is a specificity, of course, and there is an identity, but there is also a transversality of competences involved in a dialogue with different sectors of life, preparing people for other types of work, because School and University also are – and must be – demanding and rigorous places of Work.

Jean Marie Domenach, in line with other authors, says: “Il ne s'agit pas d'ajouter une spécialité à d'autres dans des programmes qui débordent déjà, mais de mettre les spécialités en relation, de les féconder” (Domenach, 1989, p. 171). He raises a question approached and deepened by others, as Edgar Morin. We can speak of disciplinarity, multidisciplinarity, interdisciplinarity and transdisciplinarity, of dynamics of transversality between knowledge and expertise: but all this requires the Culture of an Integral Knowledge, where the Whole gives sense to successive perspectives and horizons. These are the challenges for the educational practices, for Secondary and Higher Education, schools, universities and

polytechnic institutes. The University must strengthen a transversal questioning of forms of knowledge and general knowledge, meeting practical needs but also proposing utopias about human accomplishment, by successive dynamics. The University must form thinkers and persons able to act with understanding and intelligence, as essential basis for developing: not only as individuals, but as persons who also may find common grounds, namely human issues – issues of human beings – having a common purpose, within the praxis of the Common Good.

What must we teach and learn? How? For what, to what END? For that reason, ends must accompany the didactical and methodologic development, on the assumption that Educating and Philosophizing are transversal challenges in Education. Within Secondary Education and Higher Education, we must foster and develop attitudes, skills, expertise, competences and values. We must also be able to interconnect knowledge derived from the various academic subjects with curricular knowledge that do not constitute a subject, as citizenship, for example. It is fundamental that we relate, deepen and diversify the forms of knowledge within the different subjects – curricular units – with Autonomy. Did the Bologna process represent just a good intention? Or was it a reality, by creating the conditions required to form, or rather, to educate each one and all of us for our mission – for living and seeking Knowledge, in a synthesis between meaning and intelligibility? “Learning to learn” is not possible without a knowledge about this Knowledge, about its dynamics, method and organization. Several languages are needed, and they must converge in a Language that allows us to recognize ourselves as world citizens, locally and globally, in a determinate place and universally.

What knowledge are we seeking, without losing sight of ourselves, in search of the “inner master” of Saint Augustine? Who can teach us that which is not teachable? Where is our interior freedom, without which we would lose all our dignity? Today, large international organizations (such as the United Nations or the UNESCO) must be also Communities of Persons, not only abstract structures and entities. Sustainable development only is possible with persons, and taking care of them. Only sensitivity and understanding can bring people together. *Care* emerges as a Category, and as a personal, social and ecological attitude, fundamental to develop and preserve. Yet again, there is an urgent need to raise Compassion, the way in which the human being become perceptible to human eyes. Refugees and migrants, seeking the Promised Land and experiencing exodus, quest for a helping hand, a brother’s look. If we humans are to be worthy of our humanity, we need concrete and different developments, as persons and as peoples. It’s time to ignite the light of hope. We can. We are beings-toward-(im)possible. Are we up to this terrible hour in our History, with a clear conscience? Without human values, watches are superfluous. The Economy we miss demands a big capital, but an honest one, and it is mainly made of green, blue, solidarity, Being and developments, within a theory where the words ‘environment’ and ‘sustainability’ are sorceress and attract us (but with real content, with realism) toward the utopia of the Desire. The desire to Be, to strengthen Rights, also strengthening Duties. Where do we start? With the *Person*, always.

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## THE PEDAGOGICAL ORIENTATION OF PRESERVICE TEACHERS IN TEACHING PHYSICS

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### Abstract

This study investigated the pedagogical orientations of Bachelor of Education fourth year preservice student teachers at a South African university using the Pedagogy of Science Teaching Test (POSTT). This test is made up of items that depict a teaching scenario followed by four options. Each option corresponds to a pedagogical orientation. Teaching practices cover a wide spectrum ranging from didactic exposition through to open inquiry learning. For our purposes we considered four main orientations in this spectrum, which we call Didactic Direct, Active Direct, Guided Inquiry, and Open Inquiry. The analysis of data collected using POSTT revealed that students straddle between active direct and guided inquiry orientations in the teaching of high school physics.

**Keywords:** *Pedagogical orientations; physics teaching; pedagogical assessment.*

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### 1. Introduction

With growing evidence of the role of inquiry-based instruction, it is not surprising that countries in the developing world striving to increase human capacity in science and technology for development have embraced inquiry instruction as a key imperative. Accordingly, one of the major curriculum reform initiatives in South Africa has been a shift towards inquiry based teaching and learning. These developments in South Africa mirror the worldwide reform trends in science education. In the United Kingdom, Attainment Target 1 for Science in the National Curriculum has apportioned much priority to scientific investigations (Department for Education and Employment, 1999). In the United States, the American Association for the Advancement of Science (AAAS) and the National Research Council (NRC) endorse science curricula that actively engage learners using an inquiry-based approach. This is in sharp contrast to traditional science curriculum which puts much emphasis on the transmission of scientific knowledge as well as teacher-centredness and portrays the learner in a passive role. In such a teacher-centred science classroom, communication flows from the teacher to the learner and teacher talk dominates the lesson. According to Taylor and Vinjevold (1999), this teacher-centredness and learner passivity is predominant in most South African schools. Studies have revealed that learners have limited experience of inquiry learning in the science classroom (Ramnarain, 2016; Rogan & Aldous, 2005). Furthermore, inquiry-based teaching is mainly teacher controlled with learners involved primarily in the analysis of data collected and drawing of conclusions.

Learners are afforded limited opportunities in formulating the investigation question, planning the investigation, and collecting data. Teacher competence has been identified as a significant factor which affects the degree of learner autonomy in inquiry-based learning in the classroom (Ramnarain, 2016). The national drive towards inquiry-based teaching underscores an equally important knowledge component taking the form of *pedagogical content knowledge of inquiry science teaching*, which is knowledge of teaching practices that specifically reflect the investigative nature of science (Schuster, Cobern, Applegate, Schwartz, Vellom & Undreiu, 2007). To teach science successfully, teachers not only need to have good content knowledge, but also knowledge of how to translate this into appropriate teaching approaches to specific topics for particular groups of learners. Pedagogical content knowledge (PCK) integrates the melding together of subject matter expertise with pedagogical strategies to produce high quality classroom practice (Shulman, 1987; Gardner & Gess-Newsome, 2011). Pedagogical orientation has been theorized as a component of pedagogical content knowledge (Magnusson, Krajcik & Borko, 1999). Magnusson, Krajcik and Borko (1999) used the term “orientation” to refer to “teachers’

knowledge and beliefs about the purposes and goals for teaching science at a particular grade level” (p. 97). This study investigated the pedagogical orientation of preservice science teachers in the teaching of physics topics that are prescribed by the South African school science curriculum. Accordingly, the study was underpinned by the following research question:

What are preferred pedagogical orientations of Bachelor of Education physical sciences preservice student teachers when teaching physics topics?

For purposes of this study, four main orientations in the framework of pedagogical orientation were considered. These are called Didactic Direct, Active Direct, Guided Inquiry, and Open Inquiry (Cobern, Schuster, Adams and Skjold, 2012, Cobern, 2013). This framework formed the basis for assessing teaching orientations in this study. The four types of pedagogical orientations are described as follows:

1. A teacher who assumes a didactic-direct approach presents the science concept or principle directly to the students, explains, and illustrates with examples and/or demonstrations. Students apply this knowledge to questions and problems. There are no student practical activities in this method, but there are questions and discussion about the content and problems.

2. A direct active orientation similarly entails direct exposition, but this is followed by a student activity based on the presented science, e.g. hands-on practical verification of a law.

3. In adopting a guided inquiry orientation, the teacher plans an activity where students explore a phenomenon or idea, and the teacher guides them to develop the desired science concept or principle.

4. In open inquiry, students explore a phenomenon or idea on their own, minimally guided, and devise ways of doing so, after which they present what they have done and discovered. The teacher facilitates but does not intervene more than necessary. The emphasis is on the inquiry process.

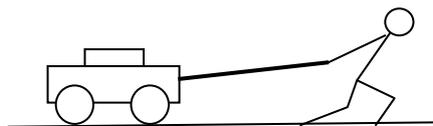
## 2. Research design and methodology

The pedagogical orientation of preservice teachers was measured using the Pedagogy of Science Teaching Test (POSTT) developed by a research group at Western Michigan University (Cobern *et al.*, 2014; Schuster *et al.*, 2012; Schuster *et al.*, 2007). The Pedagogy of Science Teaching Test consists of teaching scenario-based items. More specifically, the Pedagogy of Science Teaching Test was essentially created to assess pedagogical content knowledge of inquiry science teaching and knowledge of topic teaching practices that reflect the inquiry nature of science. The assessment itself has been developed for formative and summative use and includes over 100 items across 3 science disciplines (physical, life, and earth sciences) for various topics, grade ranges, and facets of instruction. With regard to formative use in teacher education, individual items can be used to engender debate and discussion about science teaching approaches within the context of specific topics, particular cases, and pedagogical decisions to be made primarily regarding degree of inquiry. The items are case-based and present realistic teaching scenarios for a science topic, pose a question about teaching strategies, and offer response options reflecting the spectrum of teaching orientations. The assessment items are in multiple choice format (MCQ). The example item on force and motion below illustrates the complete structure, viz. vignette, question and options. When selecting an option, participants were asked choose their preferred pedagogical orientation. The test included 10 items that were on the teaching of physics topics. The preservice teachers constituted a purposive sample within the context of this inquiry.

### 2.1. Lesson on force and motion

Ms Brandt (pseudonym) is preparing a lesson to introduce her students to the relationship between force and motion, namely, that a net force will cause an object to speed up or slow down (Newton’s Second Law of motion). The classroom has available a loaded wagon to which a pulling force can be applied as shown in Figure 1 below. Ms Brandt is considering four different approaches to the lesson.

Figure 1. Illustration of Newton’s Second Law of Motion.



Thinking about how you would want to teach this lesson, which one of the following is most similar to what you would do?

A. Write a clear statement of Newton's 2<sup>nd</sup> Law on the board and explain it carefully for my students. Then I would demonstrate the law by pulling on a loaded wagon with a constant force in front of the class as they observe the motion.

B. Write a clear statement of Newton's 2<sup>nd</sup> Law on the board and explain it carefully for my students. I would then have the students verify the law by pulling on a loaded wagon themselves and confirming what type of motion results.

C. Raise the question of what kind of motion results from a constant force. I would then guide my students to explore the question themselves by pulling on a loaded wagon and observe what happens. From the evidence they would then propose a possible law.

D. Raise the question of whether there is any relationship between force and motion. My students would then be free to explore this safely in the laboratory. Afterward we would have a class discussion of their findings.

The test was administered to 60 fourth year Bachelor of Education physical sciences preservice teachers as part of a survey. Quantitative data in the form of responses to the instrument items were analysed statistically to obtain distributions for teachers' preferred pedagogical orientations using SPSS: PASW version 18.0. The mean score and standard deviation for the frequency with which the students elected an option corresponding to a particular pedagogical orientation was calculated. This provided insight into the pedagogical orientations of the participants.

### 3. Results and discussion

The descriptive statistics on responses to the Pedagogy of Science Teaching Test are shown in Table 1 below. The percentage of responses for the four teaching options over the 10 items is provided. The mean orientation on a scale of 1 to 4, with didactic direct assigned 1, active direct 2, guided inquiry 3 and open inquiry 4 is also presented.

*Table 1. Descriptive statistics on the pedagogical orientations of preservice teachers (N=60).*

|  | Didactic direct (%) | Active direct (%) | Guided inquiry (%) | Open inquiry (%) | Mean on orientation scale of 1-4 | Std Dev. |
|--|---------------------|-------------------|--------------------|------------------|----------------------------------|----------|
|  | 21.1                | 32.52             | 38.12              | 8.26             | 2.41                             | 0.78     |

The results shows that 70.64% of students chose responses that were aligned with active direct or guided inquiry orientations. A mean score of 2.41 on a scale of 1 to 4 reflects that students straddle between active direct and guided inquiry orientations. A research study by Ramnarain and Schuster (2014) identified differences between the orientations of teachers at disadvantaged township schools and teachers at more privileged suburban schools in South Africa. In particular, the study revealed that teachers at township schools have a strong 'active direct' teaching orientation overall, involving direct exposition of the science followed by confirmatory practical work, while teachers at suburban schools exhibit a guided inquiry orientation, with concepts being developed via a guided exploration phase.

Inquiry-based learning is a key policy imperative in relation to South African curriculum reform efforts and a clear understanding of teachers' pedagogical orientation would potentially have profound ramifications with regard to successful curriculum implementation. Within the broader South African context, meaningful curriculum reform ought to make provision for context specificity of curriculum implementation as accentuated by Bybee (1993). Further insight into the critical contextual factors influencing teachers' pedagogical orientation is necessary in order to provide a solid foundation for the successful implementation of inquiry-based teaching and learning in particular. Some of the factors that have been found to influence teachers' pedagogical orientation include class size, availability of resources, teacher competence and confidence, time constraints, student ability, school culture and parents' expectations (Ramnarain & Schuster, 2014).

#### 4. Conclusion

The results show that preservice teachers tend to prefer a pedagogical orientation that aligns with inquiry-based learning within the context of this inquiry. This is a pleasing trend in view of the fact that inquiry-based learning is a key focus area of the South African national physical sciences curriculum. Preservice teachers recognized the value of teacher support for learners in the development of scientific knowledge. However, despite this positive development, it is a matter of concern that over a fifth of the participants surveyed opted for a didactic direct orientation. This orientation is teacher-directed and perceives learners in a passive role. Future research could investigate whether preferred orientations exhibited by preservice teachers in this regard translate into meaningful professional practice when taking up teaching positions at various schools on completion of their professional training..

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## REDUCING PUBLIC SPEAKING CLASSROOM ANXIETY THROUGH THE USE OF MASKS

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### Abstract

For many foreign language learners, speaking promotes anxiety especially when learners are using the language orally in the language classroom. Speech anxiety could be seen either during general communication or public speaking. The present study searched into the effects of using masks on public speaking anxiety of Turkish EFL learners. The study specifically investigated whether using masks during oral performance in the classroom alleviated public speaking anxiety of learners. The study employed a mix-method research design combining both qualitative and quantitative data collection and analysis. The participants of the study were purposefully selected from the total population of the students enrolled in a high school in Turkey. A total number of 70 learners at A1 level participated in the study. Findings of the study indicated that using masks in oral performance helped students to overcome their public speaking anxiety.

**Keywords:** *Speaking anxiety, FL learner, FL teaching, use of masks in FL, Drama in ELT.*

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## 1. Introduction

### 1.1. Speaking Anxiety in EFL Classes

Anxiety has been one of the most important issues of language learning. However, researchers still have variety of claims on how anxiety affects language learning and how it can be eased (Scovel, as cited in Horwitz, Horwitz, and Cope, 1986, p. 126; Horwitz, Horwitz, and Cope, 1986; Young, 1991; MacIntyre, 1995; Cheng, 2001; Pappamihiel, 2002; Wörde, 2003; Katalin, 2006; Zheng, 2008; Andrade & Williams, 2009). Students' performances and acquisition can easily be influenced by foreign language anxiety. Among four language skills, it is reported that output abilities such as writing and speaking produces more anxiety than input abilities such as listening and reading (Chiu et al.,2010).

The reasons for FL anxiety varies from one to another. Some of the most important ones are: communication apprehension (Horwitz, Horwitz, and Cope, 1986), test anxiety (Horwitz et al., 1986; Ohata, 2005), fear of negative evaluation (Horwitz et al., 1986; Wörde, 2003; Williams & Andrade, 2008; Aydın, 2008), being called on by the teacher (Ohata, 2005; Aydın, 2008; Awan, Azher, Anwar & Naz, 2010), learner beliefs (Cheng, 2001). Among other reasons for FLA, there are speaking activities, negative classroom experiences, native speaker effect, pedagogical practices, teachers' methods of evaluation, learning procedures, teachers' corrections, worries about being compared to other students, and not being prepared (Wörde, 2003; Ohata, 2005; Aydın, 2008; Awan, Azher, Anwar & Naz, 2010; Ay, 2010).

### 1.2. Studies on speaking anxiety in FL

Studies on FLSA has shed light on the reasons for FLSA, effects of FLSA, and the solutions for it. In the following studies, the researchers examined different types, ages, genders and levels of students from many different countries around the world. Some of the most important research are as follows. Toth (2012), who examined the oral performance of high and low-anxious students, compared to students with low levels of anxiety, highly anxious participants were found to be less able to (1) communicate spontaneously, (2) present their views/argue about a controversial issue, and (3) describe and interpret an ambiguous situation. Moreover, these students also demonstrated a poorer ability to communicate effectively and with ease, their speech was judged less fluent/more hesitant, their grammatical, as well as lexical resource was considered more limited, and their pronunciation/intonation was worse than that of their less anxious peers (p. 1170-1171). In the study of Dalkılıç (2013) a student reports that he could speak fluently with native speakers in his holiday, yet he still feels quite nervous in front of the teacher and his friends in the classroom while speaking English. As can be seen in the example, no matter how

perfectly can he speak, he still experiences speaking anxiety while speaking in front of others. Furthermore, the study of Chiu et al. reveals that students get anxious, especially when they speak English with people of opposite gender, strangers, classmates and teachers. In addition to their anxiety on English ability, they are also concerned with grammatical mistakes and English pronunciation (2010). In order to reduce the FLSA in FL learners, some of the researchers tried drama techniques in FL classes. In the study of Woodshand (2008), drama is reported to help students to speak comfortably, as much as to take the focus off themselves, not to worry about their mistakes or looking foolish (p.74). Another example of how drama can affect the speaking anxiety of EFL learners is the study of Zerey (2008), who worked with the second-year ELT students at a university in Turkey, and collected the data, in line with the present study, through interviews, student diaries and FLCAS by Horwitz et al. (1986). Zerey acknowledges the presence of FLSA at university level students. Her study reveals that, after the drama sessions, students hire decreased self-consciousness while speaking, gain self-confidence in speaking English, and the level of their courage for speaking in public increases (p.135-136).

## 2. Method

### 2.1. Participants

This study was conducted at Kozan Fatih Anatolian High School in the second term of academic year 2016-2017. The participants of the study were 70 students that were chosen through purposive sampling, 9th graders, and at the age of 15.

### 2.2. Materials and Design

In this study, the data were collected through semi structured pre- and post-interviews, pre- and post-questionnaires, and students' reflections. Public Speaking Classroom Anxiety Scale (Yaikhong and Usaha, 2012) was used as the pre- and post-questionnaire. Also, semi structured pre and post interviews were made with the 10 percent of the students. During the drama studies, participants also kept a diary to note their reflections.

### 2.3. Procedure

Before beginning the study, a six-weeks-drama programme was prepared as a guideline. The drama activities of the each week and each day were planned. Then, PSCAS was translated into Turkish. The data collection started with the administration of PSCAS as pre-test. PSCAS, a five-points likert scale, had 17 items. Then, 14 students out of 70 were randomly chosen for the semi-structured pre-interview. The interviews were conducted one-to-one in an empty room at school and they were voice-recorded so as not to miss any information. Right after the interview, drama activities started. Three films well known for the masks used within, were chosen for drama sessions. The reason why films were preferred instead of books or short stories is that when they watch a film, it becomes easier to act as it is easier to imitate a character than creating a character by oneself. During the film sessions, students were asked questions about the characters and were asked for explaining how they feel and what they think about the topic of the film. For each film, they prepared their own masks or bought them. Preparing their masks by themselves was exciting for them. All of the drama activities were prepared considering both the participants' ages, interests, levels of English and the physical properties of the school. Also the scripts of the films were prepared in accordance with the level of the students. The soundtracks of the films were efficiently used during the drama activities. Props were a crucial part of the drama exercises. Mainly the students' themselves prepared almost all the props used during the sessions which was one of the most motivating and integrating part of the study. Through the drama exercises; role play, improvisation, mime, process drama, skits, rehearsing and staging short plays and simulation were used as drama techniques.

*Table 1. Data Collection Procedure.*

| Research Question  | Data Collection Tools                   | Data Collection Procedure   |
|--|---|---|
| What are Turkish students' level of public speaking anxiety?   | PSCAS                                   | Turkish PSCAS<br>Before and after drama sessions  |
| What are the effects of using masks in speaking classes on reducing Turkish EFL students' public speaking anxiety? | PSCAS                                   | Turkish PSCAS<br>Before and after drama sessions  |
|  | Semi-Structured Pre and Post-interviews | Turkish<br>14 Randomly chosen interviewees (20%)<br>One-to-one<br>Before and after drama sessions |
|  | Student diaries                         | Turkish<br>70 Students<br>6 Weeks   |

Table 1 presents a brief explanation of which data collection tools were used for the each research question. The Public Speaking Classroom Anxiety Scale (PSCAS) was analyzed by the use of Statistical Package for Social Sciences (SPSS). Cronbach Alpha was used to test the reliability of the questionnaire and calculated as .802 for pre-test and .856 for post-test.

### 3. Results

#### 3.1. Quantitative Data Analysis Results

Data obtained through the use of Public Speaking Classroom Anxiety Scale were analyzed through the use of SPSS program. Pre and post test results were compared and the items which displayed significant differences after implementing masks in the speaking lessons were listed in Table 2.

Table 2. Pre and Post-Test Results.

| Item   | PRE-TEST |      |    |      | POST-TEST |      |    |      |    |      |    |      |    |      |    |      |    |      |    |      |
|--|----------|------|----|------|-----------|------|----|------|----|------|----|------|----|------|----|------|----|------|----|------|
|  | f        | %    | f  | %    | f         | %    | f  | %    | f  | %    | f  | %    | f  | %    | f  | %    |    |      |    |      |
| I never feel quite sure of myself while Im speaking English  | 12       | 17,1 | 26 | 37,1 | 24        | 34,3 | 8  | 11,4 | 0  | 0    | 10 | 14,3 | 10 | 14,3 | 10 | 14,3 | 32 | 45,7 | 8  | 11,4 |
| I feel confident while Im speaking English   | 0        | 0    | 2  | 2,8  | 28        | 40,0 | 29 | 41,4 | 11 | 15,7 | 14 | 20,0 | 18 | 25,7 | 12 | 17,1 | 24 | 34,2 | 2  | 2,8  |
| I feel relaxed while speaking English  | 0        | 0    | 1  | 1,4  | 22        | 31,4 | 27 | 38,6 | 20 | 28,6 | 9  | 12,8 | 21 | 30,0 | 12 | 17,1 | 12 | 17,1 | 8  | 11,4 |
| I feel anxious while speaking English  | 17       | 24,3 | 23 | 32,9 | 20        | 28,6 | 10 | 14,3 | 0  | 0    | 9  | 12,8 | 14 | 20   | 12 | 17,1 | 14 | 20,0 | 21 | 30,0 |
| Even if Im well prepared I feel anxious about speaking English                                       | 27       | 38,6 | 24 | 34,3 | 18        | 25,7 | 1  | 1,4  | 0  | 0    | 13 | 18,5 | 9  | 12,8 | 25 | 35,7 | 23 | 32,9 | 0  | 0    |
| I get so nervous when the language teacher asks me to speak English which I have prepared in advance | 11       | 15,7 | 16 | 22,9 | 21        | 30,0 | 14 | 20,0 | 8  | 11,4 | 2  | 2,8  | 7  | 10,0 | 11 | 15,7 | 23 | 32,9 | 17 | 24,3 |
| I tremble when knowing that I am going to be called on to speak English                              | 40       | 57,1 | 15 | 21,4 | 7         | 10,0 | 5  | 7,1  | 3  | 4,3  | 11 | 15,7 | 5  | 7,1  | 3  | 4,2  | 31 |      | 10 | 14,3 |
| I have no fear of speaking English   | 0        | 0    | 0  | 0    | 37        | 52,9 | 27 | 38,6 | 6  | 8,6  | 9  |      | 14 | 20,0 | 23 | 32,9 | 10 |      | 4  |      |

5: Strongly disagree 4: Agree 3: Undecided 2: Disagree 1: Strongly disagree

It is seen in Table 2 that participants in the current study seem to have speaking anxiety pertaining to having self-confidence in speaking English in the classroom setting even if they get prepared in advance. We can infer that the speaking anxiety that participants experience may stem from various reasons including their peers, the teacher, the speaking experience itself, the classroom setting, and the fear of failure. The results displayed in Table 2 indicate that the participants' anxiety reaches the highest level when they know that they are going to be called on to speak English by their teachers. We can see in Table 2 that 40 of the participants indicated that they tremble when they are to speak English. Similarly, 27 participants stated that even if they are well prepared they feel anxious to speak English. It is seen in Table 2 that the anxiety participants have continues while speaking English in the classroom as 17

participants indicated that they feel anxious while speaking English. For the item “*I never feel quite sure of myself while I am speaking English*” 12 of the participants stated that they experience this feeling in the classroom. It is noteworthy to mention that out of 70 participants in the current study, only 2 stated that they feel confident while speaking English while 29 of the participants disagreed and 11 participants strongly disagreed with the item that they felt confident while speaking English. The results of post test displayed in Table 2 show that after integrating use of masks into in-class speaking activities, the anxiety experienced by participants seems to have decreased especially when “their names are called on to speak English”, “when the teachers asks students to speak English which they have prepared in advance”. In other words, after the use of masks, the participants seem to (1) feel more confident while speaking English, (2) have less fear of speaking English, (3) tremble less when knowing that they are going to speak English, (4), feel quite sure of themselves while speaking English, (5) feel relaxed while speaking English. We see in Table 2 that while 40 of the participants stated that they strongly agree with the idea that they tremble when they are to speak English, in the post test results the number of participants who stated that they tremble while speaking English is only 11. Similarly, while 27 of the participants stated in the pre-test that they feel anxious while speaking English, the number of participants stating the same feeling is only 9. As for the item “*I feel confident while speaking English*” pre-test results indicated that only 2 of the participants agreed with the statement. However, when we look at Table 2 for the post-test results, we clearly see that quite a high number of participants (strongly agree: 14; agree: 18) went through a change in that they stated that they feel confident while speaking English. As for the fear of speaking English, pre-test results indicate that while none of the participants either strongly disagree or agree with the statement “*I have no fear of speaking English*”, the number of participants who stated to have no fear of speaking English is 23 in total (strongly agree: 9; agree: 14).

### 3.2. Qualitative Data Analysis Results

Data obtained through the use of semi-structured interviews and student diaries were analyzed through the use of content analysis. First, the themes under which the reasons why participants feel anxious while speaking English were identified. The following part gives a detailed account of the data obtained through interviews and diaries.

**3.2.1. Reasons for in-class speaking anxiety.** *Teacher as the source of anxiety:* During interviews and in student diaries it was found out that number one reason why students feel anxious while speaking English is the teacher. For the participants, teacher as the authority in the classroom causes anxiety among students. The following excerpts from student diaries and interviews clarify what participants think and how they feel about teacher as the source of anxiety in speaking class.

*S1. When I speak in class I just look into the eyes of my teacher and I usually feel anxious as I try to understand how she feels about my speech. I have had this feeling for a long time.*

*S2. In fact, I feel scared and this feeling makes me feel anxious too. I am afraid of making mistakes. I always think that what if the teacher can not get what I am trying to say.*

*Peers as the source of anxiety:* The analysis of interview and student diaries data also revealed that peers play an important role in creating speaking anxiety among participants. The following quotations from the interviews and student diaries offer a deeper insight into how effective are peers in making students feel anxious in speaking English.

*S1. I feel anxious because my friends in the classroom look at me when speaking English. I do not want to speak because I know that when I make mistakes they will certainly laugh at me.*

*S2. I am always afraid of making mistakes in class because I never want to lose face in front of my classmates.*

*The classroom setting as the source of anxiety:* The classroom setting which was stated to be anxiety provoking by the students was identified as the third reason for causing speaking anxiety among participants. The following excerpts from interviews and student diaries display participants feelings about classroom speaking anxiety stemming from the classroom setting.

*S1. It has always scared me to stand in front of the board and start speaking English. I know that I would do better if I presented a topic in my dormitory.*

*S2. The classroom setting is a stressful one because you stand up and start talking in English in front of your teacher and your friends. I automatically get stressed and feel anxious.*

**3.2.2. The effects of using masks as to reduce in class speaking anxiety.** The data obtained through post-interviews and student diaries pertaining to effects of using masks in reducing speaking anxiety among students reveal that using masks in oral performance helped students to overcome their public speaking anxiety. The following extracts from the interviews and student diaries offer a deeper account of how the participants felt about using masks in reducing speaking anxiety in the classroom.

*S1. It was so relieving to know that my friends could not see my face and thus they did not any idea of how I felt during the presentation. This feeling really made me feel relaxed. I felt less nervous and*

*anxious. It was also good to prepare my own mask and be more involved in the activities. I always want to use masks in other speaking activities if possible.*

*S2. I think that the mask I prepared made me feel relaxed. I felt less nervous. I knew that no one could see me. Even if I fail in speaking or remembering my lines, I know that neither my teacher nor my friends can understand how I feel. This is really a good feeling*

*S3. I certainly felt much more self-confident. Sometimes I could not remember what to say and I got red in the face; however, since my friends could not see my face, I could easily go on my speech. I thank my teacher for introducing such a technique.*

#### 4. Discussion and conclusion

This study has searched into the effects of using masks on public speaking anxiety of Turkish EFL learners. The study specifically investigated whether using masks during oral performance in the classroom alleviated public speaking anxiety of learners. The results of the study have shown that Turkish EFL learners experience public speaking anxiety even if they are well prepared. Sources of students' anxiety might be attributed to the teacher, peers, and the classroom setting. The use of masks in oral performance of students seems to have a significant effect on helping students feel less anxious and more confident while speaking English.

#### 5. Implications

This study has shown that use of masks helped Turkish EFL students to feel less anxious while speaking English, which might be a demanding task for most of the foreign language learners. Language teachers might try to see if such a technique would yield similar results in their own educational context.

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# UNIVERSITY PHYSICS STUDENTS' VIEWS ABOUT SCIENTIFIC INQUIRY

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## Abstract

The development of informed views about scientific inquiry forms an integral part of a key endeavour geared towards meaningful enhancement of scientific literacy. Within the realm of curriculum innovation, there is an added imperative for scientific inquiry to underpin curriculum reform efforts. In this regard, the Views About Scientific Inquiry (VASI) questionnaire was utilized to establish university physics students' baseline knowledge about scientific inquiry as an essential tenet in science education. Analysis of responses revealed fragmented and incoherent views about the nature of scientific inquiry with the concomitant implication that students appeared not to hold informed views about scientific inquiry itself.

**Keywords:** *Scientific inquiry, scientific literacy, curriculum innovation.*

## 1. Introduction

Scientific “inquiry” has been considered as a critical curriculum goal in school science education in South Africa and also throughout the world. Inquiry is a multifaceted activity and the widely quoted description provided in the National Science Education Standards captures the meaning of inquiry:

*Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. (NRC, 1996, p 23)*

Many reasons have been advanced for the prominent role that inquiry can play in science learning. Roth (1995) states that by doing inquiry, learners are provided with “opportunities for authentic inquiry, that is, inquiry with some degree of resemblance to what scientists actually do in their laboratory work” (p. 110). When engaging in inquiry, learners also describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. In this way, learners actively develop their understanding of science by combining scientific knowledge with reasoning and thinking skills (NRC, 1996). By doing scientific inquiry, learners develop capacity in applying the science process skills which is a characteristic of the scientific activity. These process skills form the core of inquiry-based, hands-on science learning (Martin, 2000). Scientific inquiry may lead to the development of higher-order thinking skills. Higher-order thinking is defined as “non-algorithmic, complex, amenable to multiple solutions, involving nuanced judgement, imposing meaning, and effortful” (Resnick, 1987, p. 3). As learners experience inquiry, they use thinking skills that cause them to reflect about their work and pose logical arguments to defend their conclusions. Inquiry contribute to learners’ social development as well as intellectual development. There is a social context to doing investigations as the learners discuss and share new ideas (Pappas & Tepe, 2002). Scientific inquiry provides learners with meaningful opportunities to discuss plans and work collaboratively in carrying out inquiry activities.

Given the strong emphasis on inquiry-based learning at the school level and its importance in the learning of science, this study investigated first year university students’ understanding of scientific inquiry. The study sought to establish the baseline knowledge of first year physics students based on their

learning experiences at the school level. Accordingly, the study was underpinned by following research question:

What is the baseline knowledge on scientific inquiry of first year physics students?

## 2. Research design and methodology

Data was collected by using the Views About Scientific Inquiry (VASI) questionnaire developed by Lederman *et al.* (2014). The VASI questionnaire is an open-ended instrument for assessing understandings about scientific inquiry. The items in VASI are based on aspects of scientific inquiry as described in the National Science Education Standards (NSES) of the United States (National Research Council, 2002). The items are linked to various aspects of scientific inquiry and scoring was done as a one-to-one correspondence between an aspect and a particular item. The responses to the items were coded as reflecting either an informed, mixed or naïve understanding of the aspects of scientific inquiry. Responses consistent across the entire questionnaire and wholly congruent with the target response for a given aspect of scientific inquiry were classified as “informed”. Responses partially explicated and not totally consistent with the target response or based on a contradiction were classified as “mixed”. Responses contradictory to accepted views of a particular aspect, or provide no evidence of congruence with accepted views of the specific aspect of scientific inquiry under examination were classified as “naïve”. The correspondence between the aspects of the NSES and the items is reflected in Table 1 below.

Table 1. Correspondence between aspects of scientific inquiry and items of the VASI questionnaire.

| Aspects of scientific inquiry   | VASI item    |
|---|--------------|
| Scientific investigations begin with a question, but do not necessarily test a hypothesis | 1a, 1b and 2 |
| There is no single set and sequence of steps followed in all scientific investigations    | 1c           |
| Inquiry procedures are guided by the question asked                                       | 5            |
| All scientists performing the same procedure may not get the same conclusions             | 3a           |
| Inquiry procedures can influence the conclusions  | 3b           |
| Research conclusions must be consistent with the data collected                           | 6            |
| Scientific data are not the same as scientific evidence                                   | 4            |
| Explanations are developed from a combination of collected data and what is already known | 7            |

The questionnaire was administered to 70 first year physics students at a South African university as part of a survey. These students constituted a purposive sample within the context of this study. The responses to the items were coded as reflecting either an informed, mixed or naïve understanding of the aspects of scientific inquiry.

## 3. Results and discussion

Table 2 below shows the percentage distribution of informed, mixed and naïve views for the sample of students. The percentages have been averaged over the 8 aspects of scientific inquiry.

Table 2. Distribution of views on scientific inquiry.

|                | Informed | Mixed | Naïve |
|----------------|----------|-------|-------|
| Percentage (%) | 48.75    | 30.63 | 19.88 |

As reflected in Table 2, just over half of the students (50.51%) exhibited either a mixed or naïve understanding of the aspects of scientific inquiry. In addition, 19.88% of these students showed a naïve understanding of scientific inquiry. However, various research studies have revealed that neither teachers nor students typically hold informed views about scientific inquiry (Driver, Leach, Millar, & Scott, 1996; Lederman & Lederman, 2004; Schwartz *et al.*, 2002). Table 3 below shows the percentage distribution of students' views across the 8 aspects of scientific inquiry.

Table 3. Distribution of student understanding across aspects of scientific inquiry.

| Aspects of scientific inquiry   | Views about scientific inquiry (%) |       |       |
|---|------------------------------------|-------|-------|
|   | Informed                           | Mixed | Naïve |
| Scientific investigations begin with a question, but do not necessarily test a hypothesis | 52                                 | 32    | 10    |
| There is no single set and sequence of steps followed in all scientific investigations    | 20                                 | 46    | 34    |
| Inquiry procedures are guided by the question asked                                       | 74                                 | 14    | 12    |
| All scientists performing the same procedure may not get the same conclusions             | 46                                 | 29    | 25    |
| Inquiry procedures can influence the conclusions  | 53                                 | 30    | 17    |
| Research conclusions must be consistent with the data collected                           | 58                                 | 22    | 20    |
| Scientific data are not the same as scientific evidence                                   | 45                                 | 32    | 23    |
| Explanations are developed from a combination of collected data and what is already known | 42                                 | 40    | 18    |

The results in Table 3 indicate that students have fragmented and incoherent understanding of scientific inquiry with regard to the sequence of steps that should be followed. Only 20% of students believed that the ‘scientific method’ is a myth. Item 1 of the VASI questionnaire elicited responses on this aspect of scientific inquiry. The item described a scenario that provided students with the opportunity to critically reflect on the relationship between the shape of a bird’s beak and the type of food eaten. Question 1c was framed as follows:

*Do you think that scientific investigations can follow more than one method?*

- *If no, please explain why there is only one way to conduct a scientific investigation.*
- *If yes, please describe two investigations that follow different methods, and explain how the methods differ and how they can still be considered scientific.*

34% of the students indicated that the investigation could “follow more than one method”. This was considered to be a naïve understanding. 46% of the students indicated that the investigation could be carried out using more than one method, but were unable to substantiate their response with a plausible explanation. These students were regarded as having a mixed understanding of this aspect of scientific inquiry. The results also showed that over half of the students appeared to have an informed understanding of inquiry in only four aspects. These aspects are “inquiry procedures are guided by the question asked”, “research conclusions must be consistent with the data collected”, “inquiry procedures can influence the conclusions” and “scientific investigations begin with a question, but do not necessarily test a hypothesis”.

Research on the readiness of learners to pursue science at university point to the need for learners to be exposed to quality laboratory experiences at school level that make provision for sufficient time to reflect on their inquiry experiences and findings (Minstrell, 1993). Studies on the implementation of practical work at South African schools have found that learners are seldom provided with opportunities to engage in scientific inquiry (Dudu & Vhurumuku, 2012; Ramnarain, 2010, Rogan, 2004). The reasons for this prevailing situation are well documented from empirical studies and relate to contextual factors at the majority of South African schools such as lack of physical resources, large classes and poor teacher professional competence (Ramnarain, 2014). Research suggests that it is the quality of doing practical

work and not the frequency that can influence understanding of inquiry and readiness to pursue science at university (Sadler & Tai, 2001). It is therefore recommended that learners ought to be provided with quality experiences through which aspects of scientific inquiry are made explicit by the teacher during post-laboratory reflective sessions.

#### 4. Conclusion

The key findings that emerged from this research suggest that the sample of first year university physics students appeared to have had limited opportunities for meaningful exposure to scientific inquiry at the school level. Further insight into meaningful understanding of scientific inquiry is required for sustainable enhancement of scientific literacy.

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# UNPLUGGED TOOLS FOR BUILDING ALGORITHMS WITH SPREGO

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## Abstract

In the present paper we introduce unplugged programming tools and provide details on their application in the Sprego – Spreadsheet Lego – environment. Since Sprego is a functional programming approach and language, the main idea of the supporting unplugged tools is borrowed from Russian matrjoska dolls, with which we are able to demonstrate how to create composite functions.

To substitute the handmade matrjoska dolls, we can buy sets of barrels, print plastic matrjoska dolls with 3D-printers, and students can make their own origami boats which can be folded into balls. The steps of the algorithms, the outputs, the output data types, etc. can be written on tapes and stuck on the surface of the plastic objects or written directly on the paper boats. Moving in an inside-to-outside direction, students can build the algorithm step-by-step. As the final phase of the problem solving process, they disassemble the set of dolls and remove the tapes, which can be recycled by pasting them in the notebooks. In this outside-to-inside direction we go through the algorithm repeatedly. All these activities are accompanied by the teacher using the enlarged version of the dolls/barrels/boats on the whiteboard.

Our experience has proved that by applying the Sprego method, along with the unplugged tools, functional programming and high-mathability spreadsheet management can be introduced to young children, and to both beginner and end-user programmers.

**Keywords:** *Sprego, computer science unplugged, algorithms, functional programming, composite functions.*

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## 1. Introduction

Research results which prove that functional languages are more effective than imperative for teaching introductory programming have mostly remained hidden away and have been reinvented from time to time, but have never reached the wide public (Booth, 1992; Hubwieser, 2004; Schneider, 2004). Discussing this problem in detail is beyond the scope of the present paper. However, it is obvious that one of the reasons for this failure is that the direct educational programming environments do not serve the interest of non-professionals (Message, 2013; Soloway, 1993; Ben-Ari, 2011). The other is that in the course of easy access to computers, many students and schools, instead of real world problem solving, focus on the coding details by claiming that programming starts when the computer is switched on.

With office applications (bureautique, ‘birotical’ software for short) novel approaches, contents, and interfaces emerged which would serve end-users better than traditional and educational programming environments. However, experience has shown that the teaching and the handling of birotical document management is mainly technocentric and decontextualized (Angeli, 2013), and as such does not support the development of end-users’ computational thinking (Wing, 2006). Skills are often learned ad hoc and many users are unaware of their own true competency (SCF, 2016). These unfortunate consequences also remain somewhat hidden, since end-user computing seems “invisible to IT professionals, corporate managers, and information systems (IS) researchers” (Panko, 2013). In the birotical world, spreadsheets play a peculiar role since they are programming environments wrapped in an office interface, and consequently have several advantages over “serious” programming environments: (1) a graphical interface shared with other birotical software, (2) real world problem solving, (3) direct connection to everyday life, and (4) the ability to support knowledge transfer in several directions – mathematics, other birotical software, programming, etc. However, approaches to spreadsheet management and its acceptance are no better than any other birotical software, despite its special programming features.

In this paper we provide details of how spreadsheets can be taught as a programming language and introduce unplugged tools (Bell & Newton, 2013) which help the development of the students’ algorithmic skills from a very early age and stage of programming studies.

## 2. Programming in spreadsheets with Sprego

Focusing on the functional languages of spreadsheets, and consequently, on their programming aspect, we developed Sprego – Spreadsheet Lego – (Csernoch, 2014; Csernoch & Biró, 2015, 2016), which is an approach and a set of tools for teaching programming for end-users and novice programmers. However, when applying Sprego we are faced with one of the crucial questions involved in teaching programming: how to develop the students’ computational thinking and algorithmic skills effectively. Since these skills are language independent, our primary hypothesis is that end-user programming starts a lot earlier than coding (Bell & Newton, 2013).

To support this hypothesis we have invented and introduced unplugged tools to help develop students’ understanding of real world problems, data analysis, the concept of function, n-ary and composite functions, discussion and debugging, and schema construction; in general terms – functional programming in spreadsheets.

One of the major features of Sprego is the application of a limited number of general purpose functions (12 functions, referred to as ‘Sprego functions’; Csernoch, 2014), while another is the use of authentic tables. With these tools we are able to provide strong support for schema construction, handling functions, and high mathability computer aided real world problem solving (Biró & Csernoch, 2015). In the present paper two of our introductory tables (Fig. 1) and some of the problems based on them (Table 1 and 2; Csernoch, 2014; Csernoch & Biró, 2016), are discussed, accompanied by the unplugged tools.

Figure 1. Authentic tables used in introductory Sprego: *IMDB Top Movies* (left; *IMDB, 2013*) and *Countries of the World* (right; *Informatika, 2004*).

|     | A    | B      | C                                     | D      |
|-----|------|--------|---------------------------------------|--------|
| 1   | Rank | Rating | Movies                                | Votes  |
| 2   | 1    | 9.2    | The Shawshank Redemption (1994)       | 790425 |
| 3   | 2    | 9.2    | The Godfather (1972)                  | 585045 |
| 4   | 3    | 9      | The Godfather: Part II (1974)         | 371343 |
| 5   | 4    | 8.9    | Pulp Fiction (1994)                   | 621174 |
| 6   | 5    | 8.9    | The Good, the Bad and the Ugly (1966) | 244920 |
| 7   | 6    | 8.9    | 12 Angry Men (1957)                   | 194680 |
| 8   | 7    | 8.9    | Schindler's List (1993)               | 414133 |
| 9   | 8    | 8.8    | The Dark Knight (2008)                | 736027 |
| 249 | 248  | 8      | The Untouchables (1987)               | 120523 |
| 250 | 249  | 8      | Papillon (1973)                       | 42632  |
| 251 | 250  | 8      | Castle in the Sky (1986)              | 38305  |

|     | A              | B       | C                | D       | E     |
|-----|----------------|---------|------------------|---------|-------|
| 2   | Afghanistan    | Asia    | Kabul            | 647500  | 27756 |
| 3   | Albania        | Europe  | Tirana           | 28748   | 3545  |
| 4   | Algeria        | Africa  | Algiers          | 2381740 | 32278 |
| 5   | American Samoa | Oceania | Pago Pago        | 199     | 69    |
| 6   | Andorra        | Europe  | Andorra la Vella | 468     | 68    |
| 7   | Angola         | Africa  | Luanda           | 1246700 | 10593 |
| 8   | Anguilla       | Amerika | The Valley       | 102     | 12    |
| 233 | Yemen          | Asia    | Sanaa            | 527970  | 18701 |
| 234 | Yugoslavia     | Europe  | Belgrade         | 102350  | 10657 |
| 235 | Zambia         | Africa  | Lusaka           | 752614  | 9959  |
| 236 | Zimbabwe       | Africa  | Harare           | 390580  | 11377 |

By analyzing the IMDB table it is obvious that the Movies column contains data of two different types. To be able to handle the titles and the years separately and the years as numbers we have to display these data in two columns. In the following, we present two tasks designed to handle this problem (Table 1, Tasks 1 and 2; Csernoch, 2014; Csernoch & Biró, 2016) and the unplugged support for solving Task 1 (Table 1): a printed, shortened, enlarged version of the table, scissors (Fig. 2), the students’ sets of dolls and boats (Fig. 3; Fig. 4, columns 1 and 2), the teacher’s set of dolls on the whiteboard (Fig. 4, column 3), tapes (Fig. 4 and 5), and notebooks (Fig. 5).

Furthermore, based on our introductory tables, we provide the algorithm for calculating subtotals with Sprego (Tasks 3–11; Fig. 6; Csernoch, 2014; Csernoch & Biró, 2016). Both the IMDB and the Countries tables serve well to provide and practice real world subtotal examples and problems. The unplugged tools used in this case are the black-, white, or interactive-board along with color chalks/markers and both the teacher’s and the students’ sets of dolls, along with the tapes. It is clear from the three-step general algorithm (Fig. 6) that by varying the yes/no question (Fig. 6, column 1; e.g. Table 1, Tasks 3 vs. 6), followed by the output values in the decision (Fig. 6, column 2; Table 1, Tasks 3 vs. 4 and Table 2, Tasks 7–9), and finally the ultimate calculation (Fig. 6, column 3; Table 1 and 2, Tasks 3–11), this algorithm would lead us to the solution of a large number of similar problems without manipulating the problem specific and problematic built-in \*IF?() functions (Csernoch, 2014).

Table 1. Introductory Sprego problems based on the IMDB table.

| #      | Problem   |
|--------|---|
| Task 1 | Display the years in a separate column.   |
| Task 2 | Display the titles in a separate column.  |
| Task 3 | Type a year in cell G2. Calculate the number of movies made in this year.                 |
| Task 4 | Type a year in cell G2. Calculate the total number of votes for movies made in this year. |
| Task 5 | Type a year in cell G2. Calculate the average votes for movies made in this year.         |
| Task 6 | Calculate the number of movies which received more than the average of votes.             |

Table 2. Introductory Sprego problems based on the Countries table.

| #       | Problem   |
|---------|---|
| Task 7  | Type a continent in cell F2. Calculate the number of countries in this continent.                 |
| Task 8  | Type a continent in cell F2. Calculate the total area of this continent.                          |
| Task 9  | Type a continent in cell F2. Calculate the population of this continent.                          |
| Task 10 | Type a continent in cell F2. Calculate the largest area in this continent.                        |
| Task 11 | Type a continent in cell F2. Calculate the capital city of the largest country in this continent. |

### 3. Unplugged Sprego tools

Unlike traditional spreadsheet course books, Sprego starts with handling strings, since even young students are able to handle text based content more confidently than numerical problems. One of the advantages of a text is that it can be printed, and with a pair of scissors the text can be separated according to the problems. In the case of the IMDB movies the text can be cut into two to separate the *title* and the *(year)* strings (Fig. 2), followed by the *year*, and finally the *year* string (Fig. 4). Furthermore, the automatic data recognition is a great help in recognizing the output data types, which leads the students to the string→number conversion (Fig. 4). The ability to handle the different data types in a conscious way can be further strengthened by consistently using the same color tape for the same the data type.

Figure 2. The content of the Movies column is cut into two in the printed version of IMDB movies.

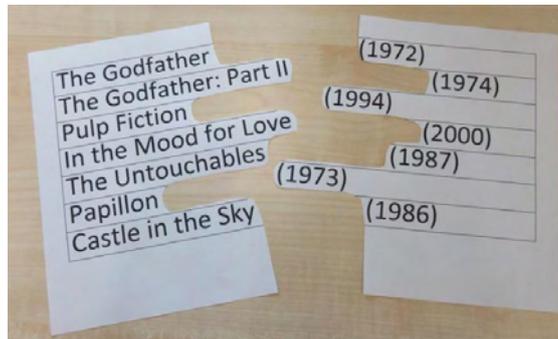


Figure 3. 3D-printed matrjoska dolls and origami boats for creating composite functions.



One further feature of Sprego is the conscious usage of vectors (Csernoch, 2014; Csernoch & Biró, 2015, 2016). Handling vectors has several advantages, detailed in our previously published papers and books. However, along with our unplugged tools, it is natural that handling all the movies/countries as one set is much more convenient than dealing with them one-by-one. Furthermore, spreadsheets are very supportive of vectors, in spite of their unpopularity. With our unplugged tools, the vectors can be written directly into the smallest doll on the board and/or on a piece of paper/tape, and then inserted into the smallest doll/boat as the primary input of the problem (Fig. 4, cells A1 and C1; Fig. 6).

Figure 4. The students' 3D-printed matryoska dolls and tapes (columns 1 and 2) and the teacher's dolls (column 3) in the process of building composite functions.



Figure 5. Disassembling the students' matryoska dolls and then the stickers fixed in the notebooks in the order of the steps of the algorithm (columns 1 and 2) and the set of boats with the steps of the algorithm written on the sides (column 3).

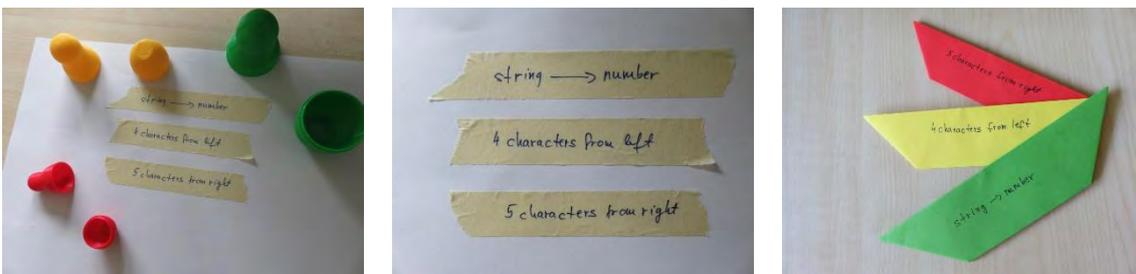
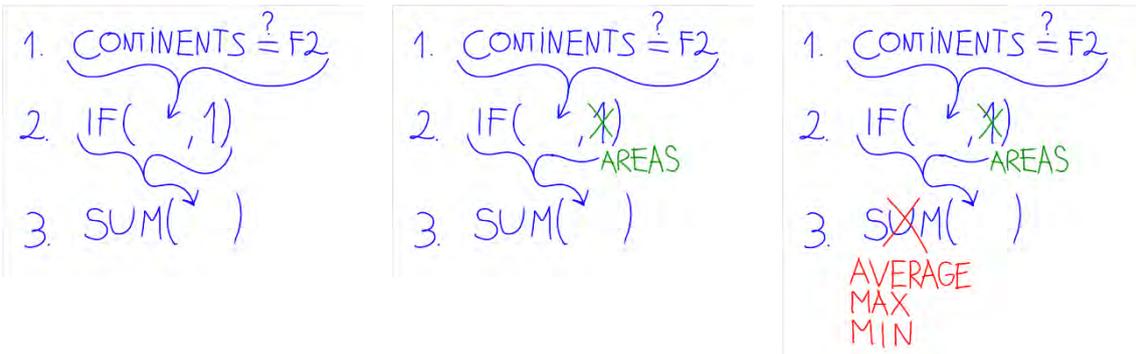


Figure 6. The handwritten algorithm and the alterations involved when calculating subtotals.



#### 4. Conclusions

Similarly to other computer related subjects, we have found that Sprego programming can be effectively supported with unplugged tools. Since Sprego is a simplified functional language and approach used in spreadsheet environments, for our purposes we have activated the classical, but recently rather neglected black- and whiteboards, furthermore, used the interactive board to save the handwritten algorithms, introduced authentic tables with real world contents and problems, and developed and applied handy tools. These tools support the understanding of real world problems, data analysis and data types, the concept of function, handling n-ary and composite functions, discussion and debugging of the problems, and schema construction, skills which are fundamental both in end-user computer aided problem solving and in professional programming.

We have found that the unplugged method presented in this paper would serve both novice and end-user programmers from a very early age by helping them develop their computational thinking and algorithmic skills effectively and efficiently, and building up transferable knowledge for further studies in programming, handling birotical documents, mathematics, and other subjects through the various contents.

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## DEVELOPMENTAL DYSGRAPHIA AND ITS PREVENTION. WHAT EDUCATIONAL ACTIVITIES?

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### Abstract

Dysgraphia is a problem that involves from 5% to 33% (Overvelde & Hustijn 2011) of European school population. The present work proposes special educational research on 3 to 6 years old children, to identify probable predictors of dysgraphia, with a preventive aim. The work presented here concerns a series of indications, collected through a special educational work that has allowed to develop a prevention program. The article also presents a series of practical, educational guidelines, whose application has proven to be effective in recovering situations where handwriting is difficult.

**Keywords:** *Dysgraphia, prevention, specific learning disorders, motor education.*

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### 1. Introduction

The University of Verona, The Department of Human Science, Inclusion and Special Education, has developed a program to assess possible specific learning disorders (specifically, dysgraphia) and to generate a series of educational interventions that - if implemented early - can improve children's handwriting skills. (Lascioli, 2011)

In particular, the research has allowed to identify some pre-requisites which are closely related to the correct development of handwriting skills. In this article we argue that these (if absent) can predict the possible onset of the handwriting disorder. Through a systematic work of observation and analysis, it was possible to define a prerequisite evaluation scheme, useful to obtain a good handwriting. From here, we started to examine possible interventions to recover prerequisites - whether absent or deficient - to develop a true protocol for prevention / intervention of dysgraphia.

The work presented here, has been experimented in 5 nursery schools, where prerequisite evaluation and recovery activities have been carried out and supervised.

### 2. Correct Handwriting prerequisites

The observations collected during the research process allowed us to identify correct handwriting prerequisites. (Sangalli, 2011)

#### *Head and shoulder control*

Observation and research have shown it clear, that in a child who does not control his head well and/or does not have a good shoulder tone, there may be problems in the use of arms during handwriting. The graphic gesture, in these cases, is done with excessive effort. For example, you may notice excessive shoulder movement. The gesture is therefore heavy and gross. Even the hand grasp is high and the wrist does not lean on the horizontal plane (this condition usually occurs in hypotonic children). The child shows his head embedded in his shoulders and if he has to turn himself, his eyes and head are unable to perform any anticipatory or independent movement from the trunk. Even when child is walking, the movement is not coordinated.

#### *Proper Muscle Tone*

The lack of proper muscle tone implies severe fatigue in handwriting. Lack of muscle tone does not allow a proper hand grasp when the use of the graphic tool is necessary. The child becomes tired easily, constantly changing it from one hand to the other often willing to abandon the task. (Sangalli, 2011)

#### *Stable sitting position*

The child who sits badly in a chair, does not support his feet on the ground or lays his arms on a table too high for his elbows, is constantly in search of postural adjustments that interfere with graphic production. A stable sitting position, however, allows a better attention at the motor task, especially in children with poor motor control.

*Hand (tactile sensitivity)*

The tactile organization of hands and fingers allows to handle the graphic tool. The child with good tactile sensitivity can properly perceive the instrument and create a scale of the force needed for its proper use. When tactile sensitivity is altered, children can hold the instrument too strong between the fingers (to feel it better) with the result that even the tract is over marked. In these cases, the child usually gets tired and gives up. On the other hand, other children, due to tactile sensitivity problems, hold the graphic tool without the proper strength for the task. In these cases, their tract looks very light and unmarked. The pencil slides out of their hands and the tactile sensitivity of the hands also causes a motor delay in the evolution of manual skills. (Sangalli 2012)

*Visual convergence and attentive keeping*

A correct visual convergence is what allows a child to look at the table at 20-40 cm from his face, enabling him to explore an image, as well as write and draw. Visual convergence issues can produce specific behaviours as, such as colouring, looking around during an action (colouring), stop looking at the sheet while a task is not completed. Actually, convergence problems explain why eyes do not follow what hands are doing. (Larocca & Sangalli, 2010)

*Brain dominance*

It has been observed that children who delay the choice of the dominant hand, are more problematic than others to organize a specialized motor scheme. The problem also arises when the non-dominant limb is selected (or by constraint or because the child is not able to independently determine his dominant limb).

*Coordinated walk*

We have found a significant correlation between a coordinated walk and a difficulty in writing. Pupils with handwriting problems (resulting from grasp and control problems during coloring) also have problems with walking coordination.

*Correct hand grasp*

Correct hand grasp is related to the learning of graphic motor scheme suitable for handwriting. Grasping correction, therefore, has shown an improved handwriting. However, correction cannot be done simply by writing. The repetition, in this case, is not good at all. Better, however, to take action using strategies suitable to generate a correct handwriting scheme. This takes time and practice. It rarely comes from a spontaneous self-correction of the child. It is better to teach the child how to improve his grasp, making him gradually abandon any incorrect scheme.

*Hand-eye coordination*

Hand-eye coordination is a fundamental intervention field in writing education. This field of intervention also includes the correct perception of the space sheet. In fact, a lack of ocular coordination impacts on the sheet space perception. For instance, the child often colours in the same point on the sheet. (Larocca & Sangalli, 2006)

*Colouring and hand movements control (3 different typologies)*

It has been noted that the pupil with dysgraphia has always a lack in colouring. The assessment of this ability is therefore an indicator of a possible presence of future dysgraphia. Thanks to colouring it is possible to evaluate the level of motor maturation of the hand. The observation allowed us to identify three types of colouring that represent the steps of the graphic gesture organization:

First type: check the sign at the edge of the figure.

Second type: independence in the control of the combined wrist control sign.

Third type: rotation and independence of the wrist with motility of the fingers. (Lascioli & Sangalli 2009)

*Wrist control*

A crucial motor element for the proper development of the handwriting is the wrist and its organization. A high grasp or rigid wrist is related to dysgraphia.

*Wrist pressure*

Hand pressure on the sheet appears to be a valid indicator of motor-related writing skills. The problem is when the child uses too much pressure (up to the tearing of the sheet) or when the pressure used is almost invisible.

*Fingers motility*

Handwriting is a fine-motion gesture. If there is dysgraphia the fingers are not sufficiently mature to carry out the required movements. The graphic gesture is slow and inaccurate, often made with wide movements of the hand that tries to compensate the lack of tactile motility.

*Orientation of the sign*

The correct sign orientation is one of the most important prerequisites to develop a good handwriting. The difficulties of space sheet perception bring to visual difficulties of specific symbols. The child who fails to reproduce the graphic sequences proposed maintaining the same orientation of the sign also manifests difficulties of spatiality (orientation in the leaf space), and letters overlapping. This is because the orientation of the letters becomes difficult when the child does not properly perceive the space on which he operates.

### 3. What possible educational interventions?

For each prerequisite, we present, different educational interventions that can be implemented where these are not present. Choosing the type of activity to be offered to the child, requires to assess handwriting prerequisites. It is in the evaluating phase that the teacher can determine, on a case-by-case basis, which type of intervention will be implemented. (Lascioli & Onder, 2006) Field experience has allowed us to verify that among the prerequisites there are neuro-genetic correlations, so the non-maturation of some prerequisites affects the acquisition of others. We have also noted that in the absence of interventions aimed at recovering the prerequisites, despite the efforts made by the child to compensate autonomously, generally he does not obtain the hoped results, for whom the handwriting is still deficient. The order we show below reflects our point of view about neuro-motor organization gesture in handwriting. (Lascioli & Sangalli 2009)

#### *Head and shoulder control*

In absence of such a prerequisite, it is advisable to propose to the child motor activities as walking, crocheting, vestibular and sensory stimulation games. (Sangalli, 2005)

#### *Stable sitting position*

The most appropriate posture for organizing the graphic gesture is the one in which the child is sitting in a chair that allows him to have feet well rested on the ground, slightly higher knees in the pelvis. The table should be placed at a height suitable for the arms, the elbow in a right angle to the table top. This posture appears to be functional to the purpose and can allow the child to stabilize the trunk, to use better the hands.

#### *Proper muscle tone*

In many cases, difficulties in handwriting are related to hypotonic problems. Recovery of muscle tone, therefore, appears necessary (especially to improve hand grasp). This can be done by offering the baby suspension games. In general, all motor-type exercises are useful to improve the muscular tone of shoulders and arms. These exercises are also useful to improve the performance in drawing, colouring, or writing.

#### *Hand (tactile sensitivity)*

Hands, as we know, are a fundamental tool of exploration and knowledge. However, in some children, using hands to explore (touch), may be problematic (this is evidenced in the presence of autism and other genetic syndromes). Helping your child to use hands to explore, touch, play, it is also essential to improve handwriting. This can be done, for example, through tactile boxes, with materials of different consistency, such as rice, flour, maize, grapefruit, stones, etc. Within these boxes you can hide very motivating objects for the child, for example: cars, games, plastic animals. Research and digging with hands, helps the child to improve the use of his hands, in particular tactile sensitivity. The stimulus given by lightweight material and heavy material allows the organization of good hand tactility. It is also very important to promote intelligent use of the hand. For example, teaching the child to find objects that can be placed inside a bag or box, without using the sight. Both these activities allow the child to obtain a superficial and deep level of touch, adapted to the correct perception of the graphic tool. Improving tactility, in fact, allows and facilitates the improvement of manual skills. (Sangalli, 2012)

#### *Visual convergence and accommodation*

In our observations we noted that some of the difficulties children encountered in colouring or drawing were clearly due to problems of visual convergence. It is obvious that if this function is absent, it is difficult for the child to look at the work table and generally at what the hand is doing, it is also difficult for the child to shift attention from what he is doing to what he is listening. The child has to be able to tell the difference between listening and performing actions. Our observations have allowed us to verify that stimulation of vestibular system (for example: rolling) improves the child's visual and auditory coordination and attention to the task. (Larocca & Sangalli 2010)

#### *Brain dominance*

According to our research and experience we are convinced that the development of brain dominance is very important in improving handwriting. It is undeniable that many children have problems of brain dominance. Among these handwriting problems are pressing. We have also verified that simple motor exercises (sliding, rolling, racing) improve the dominance. These motor activities, if continued in time for at least one month, allow to observe a progressive improvement in discriminatory capacity to use his contralateral part of the body.

#### *Coordinated walk*

Coordinated walking is an indicator that the child has reached an important stage in the development of neuro motor maturation. Generally, within three years of age children are able to walk and run in a coordinated way. It is during this phase that even the hand completes its motor maturation. Our field experience allowed us to verify that the proper use of hands occurs when during the gait arms are coordinated with legs.

#### *Correct hand grasp (figure 1)*

There is a correlation between dysgraphia and dysfunctional grasp. Generally, the best age to intervene - where necessary - is three years. There are very simple and non-invasive approaches to fit the right hand grasp. For example, for children who have hammer grasp or have a very rigid wrist, a wooden tablet can be used (figure 2). To encourage a proper thumb and index position, it can be used a cardboard holder (figure 3), or a sock with two holes (figure 4). These are simple solutions that allow you to improve hand grasp without much effort for children. Hand grasp can be improved even in children who can already write. It should be kept in mind, however, that the intervention should recover their motor memory. To be effective this technique should not be applied on writing, but on colouring.

*Hand-eye coordination*

Hand eye coordination is achieved by specific motor activities. (Sangalli, 2012)

*Colour tract (3 different typologies), wrist control, and fingers motility.*

The maturation of the movements needed for handwriting is described by three types of colouring. Figure 5 shows the first proposed colouring. It is a stencil with a black card. The child is invited to colour covering all the white spaces. This exercise allows him to mature his colouring control. The size of the image to be coloured must be very small at first, then gradually increase according to the ability reached by the child. Figure 6 shows the second proposed colouring. The child colours different images, one part at a time. It is the adult's task to outline the parts that must be coloured. Through this exercise the child improves his wrist control, so the wrist begins to be more mobilized. In Figure 7 we see the last type of colour proposal called 'Tetris'. By this latter proposal handwriting learning is actually possible. This level of colouring allows maturation of all neuronal areas of anatomical parts of arms and hands. This is also true for left-handed children.

*Sheet space organization and colouring*

Some pre-graphic exercises are presented in the following pictures. The child is able to learn how spatially organize the mark in a square, in a line and in a sheet. These exercises are the basis for the development of letter-writing. (Figure 8). (Lascioli & Saccomanni, 2009).

Figure 1. Example of bad hand grasp.



Figure 2. For children who have hammer grasp.



Figure 3. Cardboard holder.



Figure 4. Sock with two holes.



Figure 5. Stencil with a black card.



Figure 6. Second proposed colouring.

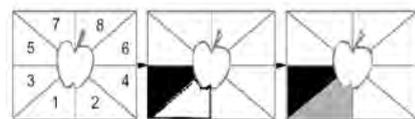


Figure 7. Colour 'Tetris'.



Figure 8. Development of letter-writing.

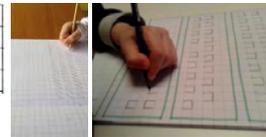
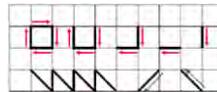


Figure 9 and 10. Before and after the treatment.



**4. Conclusions**

The results obtained by evaluating these indicators and intervening on a preventive level have allowed to decrease many cases of dysgraphia. Let's briefly list some of the pictures we have collected

before and after the above-mentioned interventions. Over the years, we have proposed this evaluation and these educational interventions in children's schools with the aim of preventing dysgraphia. Currently, data are being analysed for a research conducted on 100 primary school pupils who have done this work in the nursery school. It is our intention now to check whether preventive action is in fact able to counter the onset of dysgraphia disorder. (Lascioli, 2016)

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**PROMOTING THE RESEARCH KNOWLEDGE MOBILIZATION THROUGH  
A COLLABORATIVE ACTION-RESEARCH PROJECT IN TWO  
DISADVANTAGED SCHOOL SETTINGS IN QUEBEC (CANADA):  
CHALLENGES AND SUCCESS CONDITIONS**

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**Abstract**

In Quebec, action-research projects which promote the mobilization of research knowledge in schools are put forward as an efficient way to support school success and perseverance (Dagenais et al., 2007; Landry et al., 2008; Ramdé, 2012). In line with these recommendations, funding programs were recently implemented by the provincial government (*Fonds de recherche du Québec – société et culture*) to support action-research projects in school settings. Collaborative action-research approaches are commonly implemented with the aim to support professional development through the co-production of relevant research knowledge, while emphasizing the relevance and usefulness of experiential knowledge in research (Desgagné, 2007, Turcotte *et al.*, 2010). Hence, these types of approaches seem particularly relevant to promote the sustainable use of research knowledge in schools. However, while theoretical operationalizations associated with collaborative action-research remain fairly clear (Anadòn & Savoie-Zajc, 2007; Dolbec & Prud'homme, 2010; Savoie-Zajc & Descamps-Bernarz, 2007), its implementation in school settings entails several adjustments in relation to the partners' postures, mutual expectations and respective roles in the design and implementation of the research project, which renders the compliance with traditional quality criteria more complex (Morrissette, 2013). This paper proposes to shed light on these issues by providing a detailed analysis of the success conditions and challenges associated with implementation of a collaborative action-research project in two disadvantaged areas in Quebec. The implications of this approach with regard to the mobilization of research knowledge and the sustainability of changes in the teachers' professional practice will be discussed in relation to the quality criteria of the research project.

**Keywords:** *Collaborative action-research, research knowledge mobilization, success conditions, quality criteria, disadvantaged school settings.*

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## FOSTERING CRITICAL THINKING IN TEACHER EDUCATION

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### Abstract

In teacher education, nurturing critical thinking skills in students has the potential to influence not only the quality of education that is delivered by teachers in schools, but also to allow future teachers to cultivate cognitive skills that they will transmit to their students. This paper presents the results of an exploratory study that experimented the *Practical Inquiry Model* (PI) (Garrison, Anderson & Archer, 2000), a model that is utilized to develop critical thinking skills in a community of inquiry setting. The model, which was initially validated in an online learning environment, was experimented among teacher education students in a face-to-face setting for the current study. The purpose was to examine the type, or nature of critical thinking cues that participants utilized when reflecting, in writing, on a controversial problem that they could potentially encounter in their practice, after having received extensive instruction on various constitutive elements of critical thinking. These cues were coded and categorized according to Garrison et al.' (2000) critical thinking indicators, which highlight the presence of surface and profound ideas expressed during reflection on a problem posed. The results indicated that the majority of participants were able to propose new and innovative ideas, to reflect and to propose suggestions that went beyond the parameters of the problem, were able to consider and accept external information and were able to make relevant links to lived experiences or existing knowledge while considering the problem. Furthermore, a preponderance of profound ideas was expressed by participants in their written reflections. Results of this study can help inform educational approaches and pedagogical practices that are conducive to nurturing critical thinking in adult students.

**Keywords:** *Critical thinking, practical inquiry, teacher education.*

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## 1. Introduction

There are numerous societal challenges faced by individuals who live in democratic societies. One of these challenges is the fact that rapidly evolving technology, and increasing access to technology, have caused an abundance of information to be readily available. This evolution is also provoking complex social and societal challenges that have yet to be encountered in history. In order to help higher education students navigate multifaceted situations involving a profusion of material, it has become increasingly important to help equip them with necessary cognitive processes. Critical thinking, in part, involves an objective and in-depth reflection and analysis of an issue to take position or to guide practice and action. Thus, critical thinking involves the ability to transcend the parameters of an issue to allow for multi-faceted reflection. Researchers and educators agree that developing critical thinking skills in students at all levels of education has important societal implications (Kpazai, 2015; Williams, 2005). In teacher education, the significance of helping student teachers think critically is noteworthy, since teacher education students will have the future responsibility of nurturing these skills in their students.

The current study focussed on the extent to which teacher education students were able to manifest critical thinking when faced with a simulated case study that represented a scenario that they could encounter in their daily practice. The purpose was to examine the type, or nature of critical thinking cues that were expressed by students during data collection, subsequent to their learning about critical literacy and critical thinking, using Garrison et al.' (2000) Practical Inquiry Model (PI). This information will help to inform instruction pertaining to critical thinking in teacher education, yet can also be transferred to other educational settings.

## 2. Literature Review

### 2.1. Defining Critical Thinking in Contemporary Society

The importance of teaching students to think critically has been widely accepted by researchers over the last several decades (Kpazai, 2015; Kurfiss, 1988; Williams, 2005). The intricacies that arise in daily life, the contemporary challenges that are faced, require rational and critical thought to navigate. Researchers agree that critical thinking not only helps students succeed academically, but also helps them attain a deeper and more profound understanding of the world through a more meaningful reflection on

the information that surrounds them (Pitters, 2000). This critical and profound understanding thus allows them to contribute constructively to, and to function effectively in, democratic societies.

Defining what critical thinking is, however, can become challenging. The ability to think critically requires an unbiased and open-minded reflection that welcomes alternative and diverging perspectives concerning an issue. In a collective publication that dealt in depth with consideration on the nature, on the definition and on the operationalisation of critical thinking, Kpazaï (2015) confirmed that there is no consensus on a global and universally accepted definition of critical thinking, and that some definitional elements of critical thinking are contradictory in the scientific literature. He identifies critical thinking as an educational priority and as a transversal and transdisciplinary ability. Numerous other scientific investigations into critical thinking have attempted to define this concept. For example, Roy (2004), diverges from the notion that critical thinking is significant to specific areas of study. Moreover, he considers critical thinking to be the subject and method concurrently tending to resolve problematic and metacognitive situations to improve practice. This definition is supported by Norris (1992), a researcher who proposes that critical thinking is a process of auto-disciplined reflective inquiry, which allows the learner to see through and beyond ideological structures. Finally, the investigations of Kurfiss (1988), a researcher who has widely published on critical thinking, have traditionally defined critical thinking as follows: "It is an investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion that integrates all relevant information and can therefore be convincingly justified" (p.2). The desired outcome of critical thinking is therefore not an absolute response to a question, problem or phenomenon, but rather a reasonable explanation of a response that is founded on deep, significant and multifaceted thought.

Critical thinking indicators utilized in this study were derived from Newman, Johnson, Cochrane and Webb (1996) and grounded in the written student narratives collected. It is important to note that, in the Cochrane et al. study, the goal was to assess the feasibility of developing critical thinking in online course delivery. In the current study, students were subject to face to face classroom instruction on critical thinking and critical literacy concepts. In addition to learning about certain theoretical constructs of critical thinking, they participated in a variety of open discussion forums, classroom activities and other simulations in which they were required to adopt critical thinking.

## 2.2. The Practical Inquiry Model

According to Freire (1970/2010), a competency such as critical thinking is developed in a context where learners have an epistemological curiosity and conviviality with the subject. In order to progressively achieve a shift in interpretative authority of information, necessary for critical thinking to occur, the current study experimented the cognitive presence of teacher education students while faced with a scenario that could commonly occur in their practice. The COI targets the adoption of pedagogical measures that are of notable importance in an online learning environment, notably social presence, cognitive presence, and teaching presence. While this model may have been initially developed for a distance education program (Garrison, 1991), its application is also appropriate in a face to face teaching environment (Newman et al., 1996).

In the COI model, social presence creates a communicative climate developed and maintained by the professor through social-emotional exchanges between the learners (Garrison et al., 2000). Teaching presence is the conductor that links other components of the model (social and cognitive presence). A more recent study has concluded that this element is of primary importance in developing a critical pedagogical environment (Garrison, Anderson & Archer, 2010). The assumption was that cognitive and social presences require an educational facilitator and that when teaching presence is insufficient, cognitive and social presences will also become insufficient. Teaching presence implies the creation of a classroom climate that allows for the exchange of ideas and discussions that contain a critical analysis and a profound construction of knowledge of learners. This presence also requires feedback or a contribution from the instructor during exchanges and critical reflections (Garrison et al., 2000).

The current paper treats one constitutive element of the COI, namely the Practical Inquiry Model (PI) (Garrison et al., 2000; 2010), which particularly focusses on cognitive presence in the classroom. The operationalisation of cognitive presence in the PI is grounded in Dewey's (1933) phases of reflective thought reprinted by Swan, Garrison and Richardson (2009). This model is commonly associated with critical thought. The stages of the PI consist of the triggering event, the exploration, the integration and the resolution. The triggering event refers to the feeling of dissonance that is created by the event. The exploration phase represents the quest for information to improve or resolve the event. The third phase constitutes the gathering of information into a coherent whole, while the fourth phase describes the proposed resolution of the event (Garrison et al., 2000). As such, cognitive presence in the PI is conceived as a holistic process associated to a triggering event that resorts to ulterior phases of perception of the event, to deliberations concerning the event and to actions grounded in these phases to improve or to resolve the event (Garrison et al., 2000; 2010).

It is important to note that certain studies that have tested and experimented this model have concluded that students had difficulty reaching the integration and resolutions phases (Garrison et al.,

2010), but that these challenges could be linked to limitations in design and experimentation. Numerous studies also demonstrate that cognitive presence largely depends on the cognitive climate in which the inquiry is taking place (Garrison et al., 2000; 2010; Newman, Webb & Cochrane, 1997) and that cognitive presence is not sufficient in isolation to sustain a critical sense in a classroom. In the current paper, social and teaching presence were fulfilled by the educator responsible for the course and by students who participated in the course in which experimentation took place.

### 3. Research Method

#### 3.1. Participants

The process of selecting participants was pre-established according to two criteria: they were required to be teacher education students and were required to have participated in two courses (Critical Literacy in the 21st Century and Teaching of English). A total of 30 students agreed to participate in the experimentation designed according to the PI (Garrison et al., 2000).

#### 3.2. Experimentation

Experimentation was undertaken following teaching sessions pertaining to critical thinking. Participants learned theoretical and practical notions related to this concept, under the premise that they would eventually apply critical thinking skills in their classrooms themselves, and transmit these learned skills to their students. They also participated in numerous discussions about varied problems or issues that practicing teachers could expect to encounter during the course of their duties, and also reacted critically to numerous texts and publicities of current events. The course instructor presented the PI model to participants with the explanation that it was commonly associated with critical thought. The following fictional scenario was then presented in order to examine the extent to which participants were able to manifest critical thinking indicators:

*Mrs. X. is a veteran teacher and a popular coach for several sports. She is well known for the concern for the welfare of her students. Since the school has limited resources to accommodate practices and games for some of its teams, students are responsible for their own transportation to other sports venues. Consequently, it is not uncommon for Mrs. X. to provide personal transportation to some of her students to athletic events and back home after the events.* (Adapted from Connecticut's Teacher Education and Mentoring Program, 2012, p. 11).

Participants then reflected on the problem and attempted to find possible solutions from multiple perspectives, while describing their reasoning in writing and following the stages of the PI. Written responses were then collected and analyzed.

#### 3.3. Data Analysis

The data analysis process derives from a constructivist approach and consists of a qualitative thematic content analysis inspired from Newman, Webb and Cochrane (1995). This approach prescribes specific elements that are indicative of critical thought in the PI model. These critical thinking indicators represent surface elements (ex. repeating the information presented in the triggering event – low critical thinking) and deep elements (ex. adding new or original solutions – indicative of critical thinking) presented in participant responses, which indicate to what extent they are exhibiting a deeper level of thought.

The first step consisted of a first reading of the transcriptions collected from participants and becoming familiar with the coding scheme proposed by Newman et al., (1996). It should be noted that transcriptions were organized and treated according to the corresponding stage of the PI model. Coders then made a second reading of the transcriptions by attributing codes to every idea or excerpt. Data was analysed by noting a + beside every idea that demonstrated deep critical thought, and a – beside ideas that demonstrated surface elements, or superficial ideas. The ratio of the depth of reasoning was then calculated to determine the depth of critical thinking in excerpts. The ratio could range from -1 (demonstration of surface ideas only) or +1 (demonstration of deep ideas only), as proposed by Newman et al. (1996). The following formula was utilized:

$$\text{Depth of Critical Thinking Ratio CT} = (x+ - x-) / (x+ + x-)$$

The x+ is the total of positive ideas in a transcription, whereas the x- is the total of negative responses. The last stage of analysis consisted of representing results in a table and of noting elements representative of both types of ideas as examples.

### 4. Results

The analysis of results based on referents of critical thinking indicators reflected a preponderance of positive elements, which indicated that the large majority of participants manifested critical thinking. Table 1 (below) presents the ratio of deep and surface ideas that were exhibited by participants.

Table 1. Critical Thinking Indicators and Ratio According to Garrison's (1991) Stages of Critical Thinking and Reprised by Newman et al. (2006).

| Symbol       | Indicator   | Participant Code | CT Ratio    |
|--------------|---|------------------|-------------|
| R+           | Relevant Statements   | 1                | 1           |
| R-           | Irrelevant Statements, Diversions   | 2                | 1           |
| I+           | Important points/issues   | 3                | 1           |
| I-           | Unimportant, trivial points/issues  | 4                | 0,83        |
| NP+          | New problem related information   | 5                | 0,81        |
| NP-          | False or trivial leads  | 6                | 0,78        |
| NI+          | New ideas for discussion  | 7                | 0,75        |
| NI-          | False or trivial leads  | 8                | 0,50        |
| NS+          | New solutions to problems   | 9                | 0,40        |
| NS-          | Accepting first offered solution  | 10               | 0,33        |
| NQ+          | Welcoming new ideas   | 11               | 0,33        |
| NQ-          | Squashing, putting down new ideas   | 12               | 0,33        |
| AC+          | Clear unambiguous statements  | 13               | 0,33        |
| AC-          | Confused statements   | 14               | 0,33        |
| OE+          | Drawing on personal experience  | 15               | 0,25        |
| OC+          | Refer to course material  | 16               | 0,23        |
| OM+          | Use relevant outside material   | 17               | 0,20        |
| OK+          | Evidence of using previous knowledge  | 18               | 0,17        |
| OP+          | Course related problems brought in  | 19               | 0,14        |
| OQ+          | Welcoming outside knowledge   | 20               | 0,11        |
| OQ-          | Squashing attempts to bring in outside knowledge  | 21               | 0,11        |
| O-           | Sticking to prejudice or assumptions  | 22               | 0,09        |
| L+           | Generating new data from information collected/Linking facts, ideas and notions   | 23               | 0           |
| L-           | Repeating information without making inferences or offering an interpretation/Stating that one shares the ideas or opinions stating, without taking these further or adding any personal comments | 24               | 0           |
| JP+          | Providing proof or examples   | 25               | -0,08       |
| JP-          | Irrelevant or obscuring questions or examples   | 26               | -0,11       |
| JS+          | Justifying solutions or judgements/Setting out advantages and disadvantages of situation or solution  | 27               | -0,20       |
| JS-          | Offering judgements or solutions without explanations or justification  | 28               | -0,27       |
| JS-          | Offering several solutions without suggesting which is the most appropriate   | 29               | -0,40       |
| P+           | Relate possible solutions to familiar situations  | 30               | -0,66       |
| P+           | Discuss practical utility of new ideas  |                  |             |
| P-           | Discuss in a vacuum/Suggest impractical solutions   |                  |             |
| W+           | Widen discussion  |                  |             |
| W-           | Narrow discussion   |                  |             |
| <b>Mean:</b> |   |                  | <b>0,28</b> |

Table 1 shows that 22 of the 30 participants predominantly exhibited deep ideas in their transcriptions. Only two participants had an equal proportion of deep and surface ideas, while six participants had more surface ideas than deep ideas. The following paragraphs provide examples of ideas represented in both categories.

#### 4.1. Surface Ideas

Certain elements of participant responses represent characteristics of surface/superficial level. One example of this is, rather than highlighting new ideas during the Integration phase, one participant drew an arrow to repeat ideas presented in the Triggering Event and Exploration phases. Another statement indicates: "We must implement ways to ensure student transportation." without proposing specific ways to do so. Other statements enumerated multiple solutions, without mentioning what solution was more appropriate and explaining their reasoning. Some transcriptions indicate that all ideas proposed in the Exploration phase are appropriate, without critically sorting the information to find an optimal solution to the issue.

#### 4.2. Deep Ideas

The majority of participants, nonetheless, explored numerous resolutions from a variety of standpoints, including some viewpoints that conflicted with each other, for example: "Some negative reactions to this scenario could be false accusations towards the teacher or the student, due to the lack of supervision in the car; however, one positive aspect is that the teacher is concerned with the student's well-being." Other participants also suggested possible long-term consequences for the problem in terms of students decide to not participate in other sporting events, for example: "Students could feel uncomfortable if the teachers conducts herself inappropriately. Not knowing who they can trust can have a negative impact on students." And the following: "Students could lack confidence or motivation to

participate in sporting events... no support=no motivation.” These cases represent information pertaining to a new problem that derives from the initial problem. Other participants evoke information outside the scope of the problem, for example the fact that many inappropriate relationships between teachers and students are reported in the media. One participant suggests that even if nothing inappropriate is occurring in the car, the teacher who is interacting with students without other adult supervision is exposing herself to the possibility of accusations. Another notes that: “It is for the image of the school, of the kids, and of the community.” In this case, the school is perceived as belonging to the community as a whole rather than as an autonomous institution.

## 5. Discussion and Conclusion

As reflected in this paper and numerous other critical thinking studies (ex., Kpazaï, 2015; Williams, 2005), it is important to create teaching and learning contexts that are conducive to developing critical thinking competencies. The link between teacher training and societal efficiency for problem-solving is clear, because teachers are responsible for the education of primary and secondary students. Critical thinking competencies acquired by future teachers are indispensable to their teaching these competencies to their students, who will be responsible for maintaining an important societal mission, that of improving and maintaining quality of life for all citizens.

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## INTEGRATION OF CIVIL TECHNOLOGY THEORY CONTENT: STUDENTS' PRACTICAL WORK PERSPECTIVE

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### Abstract

The practical skills are one of the challenges that teachers faced with, when they start their teaching career in South African Technical School. One of the biggest problems is the way lecturers address practical skills in South African universities. The aim of the study is to test and suggest the methods that can be used to teach theory and practical within a timeframe scheduled in Civil Technology time table. Study used mixed method both qualitative and quantitative to collect data, in a form of pre-test (quiz test) and post- test (formal test, practical performance and presentation). The researcher used purposive sampling to select participants 16 third year degree students registered under Civil Technology were selected as participants. Sampling consisted females and males student. The results indicated that students they get more interested when they learn and apply while the content is still fresh in their mind. The study also revealed that fresh content to practical promotes creativity.

**Keywords:** *Practical Skills, Theory Content, Civil Technology, Problem Solving.*

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### 1. Introduction

Practical skills empowerment is one of the best strategies to develop and ensure the understanding of theory content acquired in the classroom. During practical performance lecturers and student are able to measure their abilities of understanding like correct use of tools, taking correct measurements, being able to read plans, etc. The results obtained from practical can pronounce evident information on what has been taught in class beneficial or not. Clark, Ewing & Threeton (2010:52) mentioned that many career and technical/technology educators endorse the application of theoretical knowledge in a lab or career and technical setting as representing an experiential base that provides students with diverse learning opportunities and experiences. Doolittle and Camp (1999), state that experiential learning aligns with constructivism which posits that learners construct meaning from their experiences.

Civil Technology uses problem solving as the main teaching method and strategy during their teaching and learning. It applies six steps of Technological process as principled guidance of integrating theory and practicals. Mokhothu (2015:17) cited Teis (2010) when stated that the aim of problem solving in technology is to stimulate a scientific method of hypothesis generation and testing. Therefore problem solving is the only method used to perform Practical Assessment Task (PAT). The Technological Process is the rationale and driving force behind this subject. Creativity, innovation and ingenuity play a major role in developing the learners' full potential in this field (LPG) (DoE 2008: 7-8). Van der Walt (2007) stated six steps of Technological Process which consists of:

1. Identify: make a meaningful summary of the problem.
2. Investigation: design brief ( describe the problem, how are you going to solve it, how it must look like and three possible solutions drawings) and specifications and requirements list
3. Design: formal drawing plan with all detail using a scale, material list and work programme
4. Making: start making your project following design you planned.
5. Evaluation and Test: compile a check list.
6. Communicate: presentation of your project (portfolio and project exhibition).

## **2. Conceptualisation of the study**

### **2.1. What is Civil Technology (CT)?**

Civil Technology focuses on concepts and principles in the built environment and on the technological process. It embraces practical skills and the application of scientific principles. This subject aims to create and improve the built environment to enhance the quality of life of the individual and society and to ensure the sustainable use of the natural environment (DoE 2012: 8-9).

The aim of the subject Civil Technology is to develop the skills levels of learners from Grade 10-12 to such an extent that they will be able to enter a career pathway at a Further Education and Training College or a university immediately after obtaining the National Senior Certificate. Learners will be ready to enter into learnerships or apprenticeships that will prepare them for a trade test (DoE 2012: 8-9).

### **2.2. What is Theory content Knowledge (CK)?**

According to Harrisa J, Mishra P and Koehler M (2014:396) Content Knowledge is knowledge about the actual subject matter that is to be learned or taught, including, for example, middle school science, high school history, undergraduate art history, or graduate level astrophysics. Knowledge and the nature of inquiry differ greatly among content-areas and it is critically important that teachers understand this about the subject matter that they teach. As Shulman (1986) noted, this includes knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge. In the case of art appreciation, such knowledge would include knowledge of art history, famous paintings, sculptures, artists and their historical contexts, as well as knowledge of aesthetic and psychological theories for evaluating art. The cost of not having a comprehensive base of content knowledge can be quite prohibitive; students can receive incorrect information and easily develop misconceptions about the content area (National Research Council, 2000; Pfundt, & Duit, 2000).

### **2.3. What is Practical Skill Competency?**

Practical work is teaching and learning activity that involves at some point the students observing or manipulating real objects and materials (Vilaythong, 2011:16; Maeko 2012:28). Vilaythong (2011:16) concludes that practical work contrives learning experiences in which students interact with materials to check and observe phenomena in a practical workshop. In order to infuse theory and practice in engineering education, Rosa and Feisel (2005:111) opine that instruction should take place in the workshop or laboratory through lecture. Mitchell and Mitchell (1992:22) suggest a simple technique of promoting linkage of topics, such as asking students to link statements to experiments in a workshop in order to link theory and practice (Maeko 2012:28).

## **3. The aim of the study**

The aim of the study is to assess the method that can be utilised to integrate theory content knowledge with practical skill performance, during teaching and learning in Civil Technology time scheduled for the subject.

## **4. Objectives**

The objective of the study is:

1. To determine how integration of theory and practical work influence teaching and learning in Civil Technology.
2. To examine the role of practical work in Civil Technology class.
3. To evaluate the practical skills competency of third years Civil Technology students.

## **5. Proposition**

Students who do practical work after the presentation of Civil Technology learning content have a better understanding of the subject concepts.

## 6. Methodology

### 6.1. Context of study

Civil Technology student were place in Civil Technology classroom for theory content, and for practical work students used their practical site which is within the campus. The study takes place in third term of their third year of studies in Bachelor of Education FET specialisation Technology (Bed: FET) four years program. The Lecturer prepared the lesson about concrete suspended floors, and then presented the lesson. After presentation: quiz, formal test, practical task and final report (assessment) were given to assess and observe the student responses.

### 6.2. Participants

All participants were Civil Technology third year students studying at Central University of Technology Free State in South Africa. The number of students who participated in the study were 16, consisted with 13 males (81%) and 3 female (19%). That indicated 100% responses were obtained.

### 6.3. Measures

A quiz, formal test, practical work (project) and investigation report, were used for the first stage of the research to the final stage the research. The questions included the following in different stages: Formal test: (a) Argue the difference between Formwork and Shoring. (b) List three types of shoring. (c) Name three types of precast suspended concrete floors. (d) As a Civil Technology student use the information from your answers above, to design and draft small project (longitudinal section view) of a brick wall and concrete slab for braai stand with a storage on a ground floor and fire space on the first floor, simulating double story house.

## 7. Results presentation and Discussion

### 7.1. Formal test

Table 1 below shown the results of formal test final mark presented by frequency and percentage (%)

*Table 1. results of formal test per student.*

| Student Name | Marks over 30 | %    |
|--------------|---------------|------|
| Student A    | 29            | 97   |
| Student B    | 20            | 67   |
| Student C    | 20            | 67   |
| Student D    | 20            | 67   |
| Student E    | 21            | 70   |
| Student F    | 21            | 70   |
| Student G    | 20            | 67   |
| Student H    | 20            | 67   |
| Student I    | 21            | 70   |
| Student J    | 20            | 67   |
| Student K    | 20            | 67   |
| Student L    | 25            | 83   |
| Student M    | 20            | 67   |
| Student N    | 29            | 97   |
| Student O    | 27            | 90   |
| Student P    | 29            | 97   |
| Average      |               | 75.6 |

The results above indicates that the highest percentage of 97% obtained by students (n=3). Followed by student (n=1) with the percentage of 90%. The position shows student (n=1) with 83%. The results further indicates that second highest number of students (n=3) obtained 70%. While majority of students (n=8) obtained 67%. The total average =75, 6. Therefore the above analysis concurred with, Pfundt & Duit, (2000) when he mention that cost of not having a comprehensive base of content knowledge can be quite prohibitive; students can receive incorrect information and easily develop misconceptions about the content area (National Research Council, 2000; Pfundt, & Duit, 2000). The statement above highlight that students should be competent in theory content knowledge in-order to be able to transfer correct content knowledge into practical work. Therefore the results have shown that students are competent theory content knowledge, which implies students are ready to be tested in practical work.

## 7.2. Practicals

Table 2 below shows the results obtained by the group during practicals performance observed

*Table 2. results of practical work per group.*

| Group Name | Marks over 100 | %    |
|------------|----------------|------|
| Group A    | 84             | 84   |
| Group B    | 80             | 80   |
| Group C    | 75             | 75   |
| Average    |                | 79.6 |

The results above revealed that group A has scored highest percentage of 84%. Followed by group B with 80%. Group C was indicated as the lowest score of 75%. While the total average was 79.6. Therefore results also pronouns that students can assure their understanding of content (theory) through demonstrating it, by doing it practically. Maeko (2012:28) cited Vilaythong (2011:16) when emphasising that practical work is a teaching and learning activity that involves the observation or manipulation of real objects and materials by students. Khoza (2004:200) suggests that teachers who are teaching practical subjects should determine ways and means by which they are to teach them as they are interesting and practical. Vilaythong (2011:16) concludes that practical work contrives learning experiences in which students interact with materials to check and observe phenomena in a practical workshop.

## 7.3. Investigation report

*Table 3. results for investigation report.*

| Group Name | Marks over 30 | %    |
|------------|---------------|------|
| Group A    | 28            | 93   |
| Group B    | 24            | 80   |
| Group C    | 25            | 83   |
| Average    |               | 85.3 |

The results above indicate the investigation of students after evaluating the final project with regard to the view, development process, construction work and the factors of structural failure. The results show that group A obtained the highest percentage of 93%, followed by group C with percentage of 83% and group B with the percentage of 80%. It therefore suggests that Civil Technology uses problem solving as the main teaching method and strategy during teaching and learning. It also applies six steps of Technological process as principled guidance of integrating theory and practicals. Mokhothu, Maimane and Rankhumise (2015:17) cited Teis (2010) when stating that the aim of problem solving in technology is to stimulate a scientific method of hypothesis generation and testing. Therefore problem solving is the main method used to perform Practical Assessment Task (PAT). Doolittle and Camp (1999), state that experiential learning aligns with constructivism which posits that learners construct meaning from their experiences.

## 8. Conclusion

In conclusion the relationship between content knowledge and practical work is one of the most important strategies in Civil Technology. The study revealed that students who performed practical work after theoretical presentation in class understand faster and better when they transfer information while it is still fresh.

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## THE RELATIONSHIPS BETWEEN NUMBER SENSE AND MATHEMATICS ACHIEVEMENT

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### Abstract

Number sense has been found to be relevant for measuring mathematics achievement in the elementary school years. However, there are conflicting or at least different ideas as to what constitutes number sense. Two basic systems of number have been identified: Approximate and exact number systems. This paper evaluates the approximate number system. There are mainly two types of task used in measuring the approximate system: pure quantity estimation and number line estimation. The purpose of this paper is to determine which type of tasks is more relevant to measuring mathematics achievement in the early years of schooling. A curriculum based math achievement test (MAT), calculation performance test (CPT), Raven Standard Progressive Matrices Test (RSPMT), 2 Mental Number Line Tests (MNL-10 and MNL 100), and Pure Quantity Comparison Test (Panamath) were used in collecting the data. Participants were 323 second graders recruited from schools located in low-middle socioeconomic areas of 2 mid Anatolian cities. In the analysis, lower 10% of the students in Raven SPMT were excluded from the analysis to avoid low general intellectual abilities. Outliers were also removed before the analysis. Final analysis was performed on 274 students. MNL-100 explained 12% of the variance while Panamath explained an additional 2% of the variance in curriculum based math achievement (MAT). On the other hand, MNL-100 has explained only 6% of the variance while Panamath explained an additional 10% of the variance in calculation performance (CPT). When it comes to MNL-10, which is considered to be small numbers for second graders, it explained 28% of the variance and Panamath contributed to an additional 4% of the variance in CPT. These results showed that the relationships between number sense and what considered to be math achievement and calculation performance is more complex than we expected. Relatively small numbers seem to be more associated with calculation performance while MNL with larger numbers were more associated with general math achievement which includes but not limited to numerical problem solving and estimation.

**Keywords:** *Number sense, math achievement, calculation performance.*

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### 1. Introduction

Calculation ability represents a very complex type of cognition, including linguistic (oral and written), spatial, memory, body knowledge, and executive function abilities (Ardila, Galeano & Roselli, 1998). Children with developmental dyscalculia have tremendous difficulties in calculation and other numerical skills. Two hypotheses have been proposed regarding the causes of mathematics learning difficulties (Henik, Rubinsten, & Ashkenazi, 2011; Vanbinst, Ghesquiere, & De Smedt, 2014). First hypothesis is domain-general cognitive deficits; the second is the domain-specific deficits hypothesis. Domain-general hypothesis suggests that children with mathematics learning disorder have deficits in intelligence, language skills, working memory, executive function, attention control, semantic memory and data processing speed and these affect mathematical performance (Andersson & Östergren, 2012). The second assumes deficits in number sense (Dehaene, 1997). It is suggested that number sense consists of two subsystems (Carey, 2001; Feigenson, Dehaene, & Spelke, 2004). One of the two sub-systems which is called approximately number systems is used to determine the approximate number of the magnitude while the other is called exact number system that helps to determine the exact number of the magnitude (Izard, Pica, Spelke, & Dehaene, 2008).

The Approximate Number System (ANS) is a primitive mental system of nonverbal representations that supports an intuitive sense of number in human adults, children, infants, and other animal species. The numerical approximations produced by the ANS are characteristically imprecise and, in humans, this precision gradually improves from infancy to adulthood (Mazzocco, Feigenson & Halberda, 2011). There are mainly two types of task used in measuring the approximate system: pure quantity estimation and number line estimation. In pure quantity estimation tasks either the number of dots in a pile is estimated numerically or two piles of dots are compared. A hallmark feature of ANS is that the imprecision in its representations increases as numerosity grows. As a consequence, the discriminability between two approximate number representations is determined by the ratio between them, not by their absolute difference (such performance is also commonly described as adhering to Weber's law) (Libertus, Feigenson & Halberda, 2013). In number line estimation tasks children are asked to estimate either the relative place of a given number or the number that corresponds the hash mark placed on empty number line that has 0 on the left and 10 or 100 on the right).

It was revealed that infants could recognize numerosities three hours after they were born (Izard, Sann, Spelke, & Streri, 2009). Moreover, the differences in unlearned approximate number sense partly explains some of the differences in mathematics achievement (Halberda, Mazzocco, & Feigenson, 2008). Numerical acuity of individuals who have mathematics disorder is problematic to the highest degree when it is compared to their peers (Piazza et al., 2010). Libertus, Feigenson & Halberda, (2013) found that early ANS acuity predicted math ability six months later, even when controlling for individual differences in age, expressive vocabulary, and math ability at the initial testing. In addition, ANS acuity was a unique concurrent predictor of math ability above and beyond expressive vocabulary, attention, and memory span. These findings of a predictive relationship between early ANS acuity and later math ability add to the growing evidence for the importance of early numerical estimation skills.

Many studies confirmed that approximate number system is not independent of educational and cultural inventions (Gordon, 2004; Halberda ve Feigenson, 2008; Nys, Ventura, Fernandes, Querido, & Leybaert, 2013). Obersteiner, Reiss, and Ufer (2013) examined the effect of training intended for enhancing first grade students' basic number processing and arithmetic skills on their approximate mental number skills. The improved number sense acuity of students with math disorder enabled them to perform arithmetic operations much more easily (Kucian et al., 2011; Obersteiner et al., 2013). Group and individual results indicate that children with math disorder mainly relied on an immature and biased-logarithmic mapping compared to typically developing children. Half of the children with DD showed a logarithmic and less accurate mapping on both interval sizes (Sella, Lucangeli, Zorzi & Berteletti, 2013).

To our knowledge the relevance of number line estimation or pure quantity estimation to mathematics achievement and calculation performance has not been compared yet. The present study aims at determining either the pure quantity estimation or number line estimation is more relevant to measuring mathematics achievement in the early years of schooling.

## 2. Methods

### 2.1. Participants

Participants were 323 second graders recruited from schools located in low-middle socioeconomic areas of 2 mid Anatolian cities. In the analysis, lower 10% of the students in Raven SPMT were excluded from the analysis to avoid low general intellectual abilities. Outliers were also removed before the analysis. Final analysis was performed on 274 students. There are approximately equal number of boys and girls in the study. The mean age was 8.3 for all the participants, 8.1 for girls and 8.4 for boys.

### 2.2. Data Collection Tools

Five different tests were administered to the participants; a curriculum based math achievement test (MAT), calculation performance test (CPT), Raven Standard Progressive Matrices Test (RSPMT), 2 Mental Number Line Tests (MNL-10 and MNL 100), and Pure Quantity Comparison Test (PanaMath).

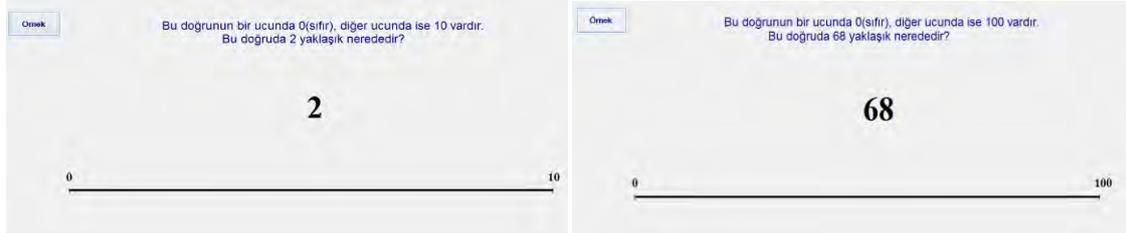
*Mathematics Achievement Test:* MAT, Mathematics Achievement Tests was developed by Fidan (2013) for grades 1-4 based on the number domain of the Turkish national education math curriculum. It includes numbers, counting, number patterns, four arithmetic operations, and fractions. KR-20 coefficients of the tests were .92 for second graders. The administration of the test took one class hour.

*Mental Number Line Test (MNL)* was developed by (Olkun & Sari, 2016) and consisted of number placement tasks. A typical number line is a horizontal or vertical line with zero on the left end and 10 or 100 on the other end. Students are requested to place the numbers shown one at a time on the number line by drawing a hash mark on the number line (see Figure 1). No timing was recorded for this

test. Only the absolute values of the difference between the estimation and to be estimated numbers were recorded in number to position tasks.

*Raven Standard Progressive Matrices (RSPM)*: The test has 5 subtests each of which has 12 items progressively increasing in difficulty. In each item a figure is given with a missing part. Participants are required to find the shape that fits the missing part.

Figure 1. Sample items from the MNL 1 and MNL 2.



*The Calculation Performance Test (CPT)*: It is developed by De Vos (1992) and adapted by Olkun, Can, and Yeşilpınar (2013) into Turkish. It has five columns of basic arithmetic operations written in Arabic numerals and arithmetic operation symbols. Each column has 40 operations. In the original study, the KR-20 coefficients were .95 and .98 for the timed and untimed administrations of CPT. The students were given one minute for each column. The main difference between MAT and CPT is that MAT has open-ended word problems while CPT has only arithmetic operations with Arabic numerals.

*Panamath*: This is the test used for measuring pure numerical estimations. Participants were asked to decide which side has more dots in a given box that has blue and yellow dots (see Figure 2). The ratio between the number of blue and yellow dots ranged from XXX to YYY. There are different sizes of dots in each side and the place and color of larger side randomly changed. Both accuracy and latency scores were recorded in a database.

Figure 2. Two sample tasks in Panamath.



### 2.3. Analysis

The lower %10 (32 students) in the RSPMT was excluded from the analysis. Outliers (17 students) were also removed from the data. The final sample consists of 274 participants. Row scores were used for MAT, CPT and RSPMT. Total absolute errors were calculated for MNL 10 and MNL 100 (Booth & Siegler, 2008). Weber fraction calculated by the Panamath software has been used as the score for pure quantity estimation. Correlations among the tests were calculated. Stepwise multiple regression analyses were performed to calculate the explanatory power of Panamath Weber and MNL test scores on estimating MBT and CPT test scores.

### 3. Results

First of all, correlations among the tests were calculated. The highest correlation was calculated between MNL 10 and CPT scores, MAT and Raven scores. Another interesting finding of the study is that while RSPMT was strongly, significantly correlated with MAT it was only moderately correlated with other tests. It is also surprising that there is virtually no correlation between Weber fraction scores and MNL 100. This may mean these 2 test measures different aspects of the numerical cognition. All other correlations are statistically significant (see Table 1 for details).

Table 1. Correlations among the tests used in the study.

|         | MAT | CPT  | MNL-10 | MNL-100 | Weber | RSPMT |
|---------|-----|------|--------|---------|-------|-------|
| MAT     | -   | .39* | -.22*  | -.31*   | -.15* | .53*  |
| CPT     |     | -    | -.54*  | .23*    | -.30* | .19*  |
| MNL-10  |     |      | -      | .19*    | .23*  | -.18* |
| MNL-100 |     |      |        | -       | .02   | -.32* |
| Weber   |     |      |        |         | -     | -.18* |

\*p&lt;.01

Gender analysis showed that there were no statistically significant differences between boys and girls in MAT, CPT and MNL 10 however boys did statistically significantly better on both MNL 100 and Weber fraction. See Table 2 for further details.

Table 2. Gender differences.

| Gender | MAT      |       | CBT   | MNL-10 | MNL-100 | WEBER |
|--------|----------|-------|-------|--------|---------|-------|
|        | N        | Mean  | Mean  | TAE    | TAE     | Mean  |
| Girls  | 122      | 11.81 | 50.09 | 26.75  | 451.56  | .266  |
| Boys   | 152      | 11.68 | 50.28 | 25.00  | 406.59  | .296  |
|        | <i>p</i> | .713  | .942  | .322   | .043*   | .029* |

\*p&lt;.05

In order to determine the explanatory power of MNL 10, MNL 100, and Weber fraction on mathematics achievement measured by MAT, a linear regression analysis (enter method) was performed. Results showed that MNL 10 ( $R = 0.216$ ,  $R^2 = 0.047$ ) explained 5% of the variance ( $F_{(1,271)} = 13.280$ ,  $p < .01$ ) in MAT. Similarly MNL 100 ( $R = 0.311$ ,  $R^2 = 0.097$ ) explained 10% of the variance ( $F_{(1,272)} = 29.143$ ,  $p < .01$ ) in MAT. Both variables ( $R = 0.350$ ,  $R^2 = 0.123$ ) explained 12.5% of the variance ( $F_{(2,271)} = 18.927$ ,  $p < .01$ ) in MAT together.

Another linear regression analysis was performed to see if MNL 10, MNL 100 and Weber fraction explains any variance in CBT. MNL-10 ( $R = 0.535$ ,  $R^2 = 0.286$ ) explained 29% of the variance ( $F_{(1,272)} = 109.11$ ,  $p < .01$ ). Similarly, MNL 100 ( $R = 0.231$ ,  $R^2 = 0.054$ ) explained 5% of the variance ( $F_{(1,272)} = 15.383$ ,  $p < .01$ ) in CPT. Both variables together ( $R = 0.632$ ,  $R^2 = 0.400$ ) explained 40% of the variance ( $F_{(2,271)} = 90.285$ ,  $p < .01$ ) in CPT.

In order to see if Weber fraction scores explain any variance in MAT and CPT, a linear regression analysis was run. Results showed that Weber scores ( $R = 0.149$ ,  $R^2 = 0.022$ ) explained 2% of the variance ( $F_{(1,271)} = 6.175$ ,  $p < .01$ ) in MAT while they ( $R = 0.302$ ,  $R^2 = 0.091$ ) explained 9% of the variance ( $F_{(1,272)} = 27.253$ ,  $p < .01$ ) in CPT.

Taken together, Weber fraction and MNL 10 (small numbers) contributed more to arithmetic performance as measured by CPT than mathematics achievement as measured by MAT. On the other hand, MNL 100 (large numbers) contributed more to mathematics achievement than arithmetic performance.

#### 4. Conclusion

The results of this study showed that the relationships between number sense and what considered being math achievement and calculation performance is more complex than we expected. Relatively small numbers seem to be more associated with calculation performance while MNL with larger numbers were more associated with general math achievement which includes but not limited to numerical problem solving and estimation. Pure numerical estimation or quantity comparison skills on the other hand contributed more to mathematics achievement than calculation scores although we used relatively large numbers of dots to be compared in this test.

Results of this study also showed that the skills measured by pure numerical comparison tasks or analog quantity comparison with dots as measured by Weber fraction score have more to do with small with arithmetic performance than mathematics achievement.

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## **LEADERSHIP FOR SCHOOL REFORM: A CASE STUDY FROM A NEW YORK CITY RENEWAL SCHOOL**

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### **Abstract**

The authors measure and analyze the successful implementation of a renewal program instituted in a New York City high needs urban high school. The program is designed to transform the school climate and academic performance through a qualitative and quantitative analysis of student performance on standardized exams. Schools in the renewal program are labeled “time out” and must show sustained improvement in various measures of student performance or face being closed. The core curriculum is four years of English, Global and American History, Science, Math, and one year of foreign language. In addition to passing the courses, students are required to pass exit examinations in each subject area. The renewal program at this school is based on the Scaffolded Apprentice Model (SAM) program, a two-year administration program housed at a local branch of the City University of New York. Teachers enrolled in the program work toward state certification in School Building Leadership that qualifies them for the positions of principal and/or assistant principal. The SAM – Scaffolded Apprentice Model is a leadership program where leadership skills and a leadership philosophy are developed through a combination of classroom instruction and leadership practice in the school arena. SAM participants work individually and collectively to connect with and redirect at-risk students in their own classrooms and schools which are generally schools that have been identified as failing by municipal and state governing bodies. SAM participants analyze institutional practices in their schools and recruit colleagues to join in the analysis process with the goal of reforming practices in the organization and operation of their schools. School principals play an important role in the leadership program, recommending teachers identified as potential leaders who can accelerate needed change in their schools and then supporting them in their work. The authors observed dialogue at work team meetings, analyzed written work by school leaders, and joined with teams in evaluating the ability of the program to impact on student academic performance. The study demonstrates the possibility of developing school-based leaders as a force for school transformation and points toward more long-term research on the role teacher leaders can play in turn-around schools.

***Keywords:*** *Reform, Transformation, Leadership, Renewal.*

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## TEACHING IN A GLOBAL WORLD: HOW ECONOMY DEFINES EDUCATIONAL POLICIES

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### Abstract

In today's academic world, it seems that motivating critical and analytical thinking in students has lost its relevance. One way to exercise and build both the power of observation of reality and the construction of knowledge, is teaching methodology. But when noticing that currently those analytical and reading skills are not considered relevant to develop, therefore, we could ask ourselves:

How to understand this shift or minimization about the methodology and its teaching? Which can be the starting point to consider the loss of the importance of methodology in the education? In search of arguments to answer these and other questions, we can say that it is possible to address this problem as a part of a multi-causal phenomenon that cannot be reduced to educational contexts only, instead, it falls within the dimensions of economic and political processes.

It seems that as a specific issue it is not related to these dimensions, and that it is far from having any type of connection. In addition, it might also be thought as a purely pedagogical problem, whether how to teach research techniques, or perhaps to a matter of conceiving methodology according to a certain perspective. However, this problem is immersed in a much more complex process which involves the displacement, minimization and even the disappearance of subjects related to philosophy (ethics, logic), history and others in the field of Humanities. As a result, these related subjects have been considered unnecessary because they are not directly linked or connected to economic production.

The point is to articulate social processes to the market dynamics. In education, this issue is presented as a series of transforming policies: several reforms towards education, changes in plans and curricula according to the needs of the production world. In this sense what prevails in academic reforms are political decisions, to materialize in terms of educational and pedagogical models and contents the guidelines imposed by the logic of the market.

Therefore the context in which methodology, its teaching and importance in the academic and intellectual training, is located, can be seen from a logic related to an articulated process: market dynamics - social control and direction of a qualified workforce trained according to standardized criteria.

**Keywords:** *Teaching, educational policies, globalization process.*

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### 1. Economic processes and education

From 1982 the world has changed drastically, leaving aside the Keynesian formulas that remained until that moment: the state played a central role in the organization and direction of social processes. Formulas that allowed to face the consequences and sequels of the economic crisis of 1929; which in one way or another made it possible to consolidate the world hegemony of the United States, became a new model of accumulation, where the market and not the State was given the leading role for the organization of social life on a world scale.

The changes derived from this model occurred in all spheres of social life: from the world of production, to the sphere of public life, through health, culture and, of course, education.

On the one hand, the production processes were standardized; international standards were established whose purpose was not only to efficiently and accelerate the recovery of profits, but mainly to homogenize and simplify production processes where the skilled workforce was not as important as that with a series of labor competencies, replaceable, Docile and not demanding in terms of salary.

In this context, two aspects are central. First, the need to accelerate the accumulation of wealth and second, to modify the relationship schemes according to the labor force. Hence the imperative to standardize the profiles to form the new type of worker required by this economic model, with an

ideology suitable to the scheme of accumulation. It was tried to multiply the action of the market and to limit the intervention of the State, because the market is not corrupt but so is the State.

### **1.1. The competency model**

Production processes require competent personnel only at certain stages of the process. The basic competences required by the standardization of production are defined. Hence the structure of the basic skills model is exported to other spheres of social life, relevant to education.

These circumstances have had at least two important consequences for education. The first is to transfer the training process to institutions of middle and higher education with the purpose of not sacrificing profits. Through the incorporation in the curricula of professional practices and entrepreneurship programs with the aim of transferring responsibility to educational institutions to train future employees according to the model of competence.

In other words, the institutions absorb the cost of training for the formation of labor force according to the needs of companies, the market. Consequently, the transformation of plans, curricula and content according to this logic.

### **1.2. Adapting to market needs**

These are some of the reasons why Social Sciences and its teaching (methodology, philosophy, logic, history, arts and other cultural expressions) are unnecessary for the market and therefore can be dispensable. For example, in the case of methodology, it is only required to know technical-instrumental aspects necessary to produce quantitative and descriptive knowledge. Only matters what fits the competency model, the rest can be minimized, displaced or even eliminated from the academic and intellectual training of students.

It is clear, moreover, that the elimination of the methodology is not only a curricular question but an entire ideological system that happens to be materialized in educational policies, ranging from the way of personnel selection and teacher training, to the relevance of the editorial proposals of the market that leads the schools curricula.

### **1.3. Key points**

- a) The processes of the neoliberal stage of capitalism have required a reconstruction of the workforce according to standardization logics.
- b) The responsibility for job training has been transferred entirely to educational institutions.
- c) The market's own interactions have built a legitimating discourse for educational institutions, expressed in the competency model, professional practices, entrepreneurship programs and university-business linking.
- d) The market needs do not require a critical formation, (in the sense of imagination, creative thinking) but graduated with pragmatic competences, utility and immediate application.
- e) These educational processes have formed a docile labor force, flexible, dispensable and standardized.
- f) Nowadays, the teaching of the methodology refers to a training based on manuals and it is limited to the teaching of technical and instrumental resources, which do not seek explanations but quantitative data.

## **2. Political processes and globalization**

It seems an exaggeration to mention a link between political processes and the importance of methodology and its teaching. However, there is a connection as a result of the political decisions materialized in the form of government programs.

It is reasonable to think that the year 1982 was one of the first steps in the development stage of globalized capitalism in the sense given by De Sousa (2005: 260). "Globalization results from a set of political decisions identified both in time and in relation to its authorship. The Washington consensus is a political decision of the central states, as are the decisions of the states that adopted it demonstrating a more or less relative autonomy and selectivity". Since these events the world begins to transform in function of those decisions that were crossed by economic interests. It is understood that the globalization process was proposed to redefine a model of accumulation for the benefit of the central states.

It will be necessary to distinguish globalization as an incessant process of development resulting from the incorporation of scientific and technological advances to social fields, from the changes that have occurred in the economic sphere. In both processes transformations have taken place on a global scale. The first will continue on the ruins of the neoliberal stage.

## 2.1. The neoliberal influence

In the political sphere is where the decisions have been given with greater emphasis to introduce the necessary modifications for the development of the neoliberal model. David Apter (1971) says that no modernizing effort on economic processes can take place without the corresponding political modernization of countries. In other words, without the introduction of mechanisms that allow control and social direction enables the introduction of economic innovations. This process of introducing neoliberal strategies is seen as a kind of paradox, while politics is necessary for the implementation of the model, it is at the same time relegated to the background with the purpose of limiting the participation of the State in the economic process.

The result of this paradox was the subjection of politics to private interests, or to economic interests. Public life was subordinated to privatization processes, which means that these interests have dominated the realm of public life. Increasingly the privatizing eagerness invades more social spheres, health and social security, culture and education.

In Latin America, governments (mainly from 1988 to date) have defined public policies and strategies to concretize these processes, while shifting their political and social responsibility to market forces (Hertz, 2002). This means that politics has been subordinated to economic processes. These are the circumstances that underlie the crisis of politics: the administration of the public under the logic of the private. In such way that political decisions are oriented to incorporate to the market all those areas of the public life that can be highly profitable, as it would be the case of education.

In order to illustrate this, we transcribe a note from La Jornada newspaper (Thursday, January 3, 2013, p.4). It is said that "Public education has suddenly become a new market, thanks to the reforms promoted during the last decade ... A conference of investors interested in the for-profit education sector (Capital Round Table For-Profit Education Private Equity Conference), in July last year, affirmed that education is now the second largest market in the United States, valued at 1.3 trillion dollars ... Indicates that the opportunities in the profit-oriented education sector are being expanded thanks to initiatives promoted in the Congress ... "

On these essentially political approaches, academic reforms have been promoted within universities and institutions of higher education. These seek to establish the model by competencies and managerial orientations as the preferred option for the transformation of curricula and its contents, as a consequence of the logic of the wealth accumulation model to guide policy decisions and the character of government programs.

## 2.2. Key points

- a) The neoliberal model has subordinated politics to the market interests.
- b) The State becomes an instrument to guide privatization impulses in all areas of social life.
- c) Education has become a vehicle for consolidating the market in a double way: education has become a commodity and a space for the formation of flexible labor force with the basic skills that require the productive processes.
- d) Policy-oriented academic reform movements have been proposed to stimulate and shape the education transformation processes.
- e) All contents and subjects that are not functional and cannot be articulated with the needs of the market have been displaced.
- f) Politics has become the means and the domain to promote privatization flows.

## 3. Final remarks

During globalizing process of capitalism, all transformations have taken place on a global scale, but they have a differentiated impact on the local level and are accompanied by visions of the world, that is, ideologies that legitimize these transformations. Just as politics became a privileged instrument to promote them, education has been fundamental for its materialization.

Under the idea of *knowledge economy* (which means applying technological scientific advances to productive processes, introducing a new rationality to increase productive capacity), and *knowledge society* (idea which emphasis knowledge as the engine of social development) establish two fundamental elements to guide educational processes.

Educating for life, educating to do, educating to be, have become part of the ideological imperatives to guide education according to the needs imposed by the market. From here, a series of strategies emerged that translate into government policies and institutional programs aimed at reorienting education trends.

Quantitative evaluation systems, financing strategies linked to stimulus programs and pedagogical options: such as the competency model, teaching modalities that tend to fragmentation, are

introduced into the system. These have modified the academic and administrative forms and practices inside the institutions.

As the competency model has been transferred from the world of production to educational processes, training priorities and content respond to these imperatives. The federal authorities themselves, the financiers of public education, have introduced, motivated and supported these guidelines.

In this way, those subjects defined as practical or technical, the ones that teach to do, are those that acquire greater relevance within the curricular structures. For its part, the subjects that belong to Social Sciences and Humanities have tended to minimize their importance for vocational training; they tend to be eliminated or reduce the number of subjects within the curricula and seek to give them a technical or practical orientation, as possible according to the competency model.

Taking these approaches into consideration, it is possible to establish some topics to locate the loss of importance of critical thinking, and specifically of methodology and its teaching, in the academic and intellectual formation of students.

a) Educational processes are articulated to the logic and dynamics of economic innovations worldwide.

b) The role of governments has been fundamental in the reorientation of education and, therefore, institutional programs are the product of political decisions rather than academic.

c) Political decisions on educational orientations underlie ideological contents that express the imperatives of the wealth accumulation model.

Thus, the problem of the importance of methodology and its teaching is not only a didactic-pedagogical problem, but also a problem of priorities for education and relevance to the challenges that the development of capitalism itself has generated: It assumes the preservation of environmental conditions, a fair distribution of wealth and the knowledge to solve old and new problems of the natural and social reality of the planet (Wallerstein, 2001)

Finally, after these considerations, the following question can be asked: What will happen when the imperatives imposed by the economic model change and the needs to solve the new problems of world societies may be different? It is highly probable that, if this tendency continues to be accentuated, future generations (in the short term according to Braudel's idea, 1974) will face the problem of the loss of scientific vocations.

From this point of view, the loss of importance of critical thinking and its teaching represents a future problem if universities are neglecting to teach to think, and with it to build the resources to explain and respond to emerging problems that will be presented to the new generations.

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## CONTROVERSIES SURROUNDING SEX EDUCATION: A CASE STUDY

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### Abstract

Provision of sex education by Ontario Canada government schools to children and youth can be very controversial. Attitudes of parents and other members of the public about sex education can fuel controversy regardless of the need for sex education and the research which supports provision of this education. Perceptions of age appropriateness of the content of sex education, perceptions of who the appropriate parties are to provide sex education to children, religious and cultural perspectives, and ages of children receiving sex education are some of the aspects that may fuel the controversy. Societal conditions and developmental needs of children may be given less relevance in favour of these perceptions, particularly in the case of sex education for middle years (ages 6 to 12 years) children. While viewed as an effort to aid children, the controversies may contribute to an inability to ensure children are adequately prepared for the societal and developmental realities they are facing.

This presentation uses a case study approach to examine the controversial sex education curriculum introduced in Ontario Canada in 2015. The case study focuses on curriculum for middle-years children and question the controversy which arose upon its implementation. The curriculum content is examined relative to the current research understanding of sexual development during the middle-years. Content is analyzed against the results of our 2016 synthesis of sexual development research from 2009 to 2016 pertaining to the middle-years, which was prepared for the Ontario government in aid of the development of a policy framework for middle-years children's policy. The analysis is placed within the context of key factors present in Ontario society today, which influence sexual development generally and for middle-years children specifically. The nature of the controversies which have arisen are examined relative to the goodness of fit of the curriculum and the societal situation within which children develop. Finally, conclusions and recommendations concerning curriculum content and approaches to addressing controversies are provided.

**Keywords:** *Sex education, sexual development, middle-years children, parental attitudes.*

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## **THE ARDUOUS JOURNEY OF THE HIGH FUNCTIONING AUTISTIC/ASPERGER SYNDROME INDIVIDUALS FROM THE SCHOOL SYSTEM TO THE WORKPLACE: A CANADIAN MODEL**

**Christine Besnard**

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### **Abstract**

In Canada, enormous efforts have been deployed by the school system (The Ontario School Curriculum, 2013) and post-secondary education to create inclusive learning environments. Indeed, learners with special educational needs such as, for example, the high functioning autistic/Asperger syndrome students, are being accommodated in order to give them a chance to succeed not only academically but also socially, psychologically and culturally in their learning environment. And because this issue is considered as a social justice one, by implementing full inclusion in their curricula, programs and classroom practices (Besnard, 2012), institutions strive to educate all 'typical' students as well as their families to the social benefits of the full inclusion of 'atypical' individuals with special needs in society from birth to old age. And gradually, Canadians are opening up to the idea that full inclusion should not be limited to primary schools and post-secondary institutions but also to the job market, the health system, and retirement places (Geneva Center for Autism, 2014).

This presentation will be based on my experience in helping families with high functioning autistic/Asperger syndrome children break social and academic barriers in order to be fully included, with the necessary support and accommodations, in the Canadian academic system. I will present the numerous challenges that have been overcome, and success that have been accomplished for the last twenty years in the Canadian society which, because of its multicultural identity, is quite open to diversity (Besnard, 2015).

I will then explore the issue of whether or not the establishment of more equity in schools and post-secondary institutions is triggering substantial social change and equity in the current competitive labor market. In other words, I will explore whether or not today, in Canada, students with autism who have graduated from post-secondary institutions have a better chance than before, to be successful in their job search (Weiss, 2016). Are they still hitting a wall in their employment search or do we start seeing some cracks in mentalities and professional practices surrounding the social and societal issue of opening up the job market to adults with autism by acknowledging their hidden strengths and abilities while accommodating their needs (Autism Speaks, 2016)? Do we see more cooperation between academic institutions and businesses/industries via the establishment of transition programs, workforce and career models, tool kits and internship projects in order to increase the employment participation of these individuals?

**Keywords:** *Social justice, Education, Autism, Employment.*

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## INTERNATIONALIZING ALLIED HEALTH CURRICULUM

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### Abstract

As stated by Leask (2009), an internationalized curriculum develops the international and intercultural perspectives of students. It is as much about the content (the information) as it is about the skills and attitude differences found in non-native countries. Within the health care disciplines, multiple references can be found related to opportunities to incorporate international service-learning, clinical internships, and study abroad into the curriculum to provide international opportunities for students (Banhidi et al., 2013; Crawford et al., 2010; Pechak & Thompsan, 2010). Experiences such as these allow the opportunity for students to develop global competencies to practice successfully in diverse environments.

At Fresno State, our mission and strategic plan emphasize the importance of providing students with global awareness and an internationalized curriculum. The strategic directions of the College of Health and Human Services further highlight this area as an important curricular component. While study abroad programs and other forms of international travel, such as service-learning trips, are a valuable means to providing students with international experiences, these options are not available for all students. As identified by the American Council on Education, changing student demographics, financial challenges, and low study abroad rates increase the importance of making sure all students are prepared to live and work in a global society.

The purpose of this paper is to describe a variety of strategies used to enhance the internationalization of two health care disciplines, therapeutic recreation and physical therapy, within the College of Health and Services. The paper will explore how these two departments utilize university resources and strategic partnerships to enhance international opportunities in their curriculum. Included in the discussion will be campus-wide events such as international coffee hour; interdisciplinary study abroad programs focused on health care; international clinical internships and fieldwork opportunities; visiting faculty and students from other countries; class assignments, and the integration of faculty research on international topics into courses.

**Keywords:** *International, Health, Curriculum.*

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# DEVELOPING EFFECTIVE UNIVERSITY GOVERNANCE IN KNOWLEDGE BASED SOCIETY

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## Abstract

The characteristics of a higher education institution (HEI) such as: professional domination, fragmentation of decision-making, increasing diversification and diffusion of power calls for a new governance model. The main purpose of this paper is to examine crucial issues in effective university governance. We apply the qualitative methodology based on the descriptive study, comparison, critical assessment and interpretation of the relevant scientific achievements within the defined problem area. The research questions cover the three main areas: the new paradigm of entrepreneurial university, the importance of regional and international networking and the strengthening of university institutional autonomy. We provide the integrative framework for university governance that meets the requirements of university dynamics in the new knowledge based economy.

**Keywords:** *University, governance, entrepreneurship, knowledge based economy*

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## 1. Introduction

Nowadays, the HEI are under great pressure of competing priorities and demands. Globalization, new technology, energy security, climate changes, complexity, ageing and migration, knowledge-based economy are some of the key challenges for the higher education sector that require new a governance model. The debate about the new role of university in the 21<sup>st</sup>- century and effective governance model is still open and characterized by contradictory theoretical concepts and practical solutions. The main tensions appear from differences between the traditional university model that represents high-quality academic and scientific education and the new entrepreneurial model which is characterized by a high degree of openness towards society, especially towards the business sector. General agreement exists that in the knowledge-based economy, university represents a critical factor in innovation and plays a central role in the success and sustainability of economic growth and development. On the other side, government policy levers seem more constrained than ever before, largely due to fiscal constraints made more acute by the global financial crisis. Overall, it is obvious that the establishment of the system of sound university governance, is the main priority in higher education sector in order to empower universities with greater decision-making rights, autonomy, together with greater accountability. However, the implementation of new university governance model is very difficult, since the higher education sector has its own very particular organizational and cultural traditions, shaped by the requirements of very specialized professional knowledge and academic freedom (Christensen, 2011). The new university governance arises from the New Public Management (NPM). All of these stress the necessity for further research of new university governance systems that should comprise two strategic priorities – excellence in providing research, teaching and services and on the other side the professional management of human resources, investment and administrative procedures. Higher education has the unique position in training knowledge workers and its mission is crucial for success in knowledge-driven economy. The paper deals with the problem of effective university governance in knowledge-based society. The main research question is whether the university governance should overcome the HEI fragmentation into faculties, departments, laboratories and administrative units or retain the variety of organizational forms in order to stimulate flexibility and innovativeness. Regarding this, we distinguished three main areas that are of great importance in knowledge-based economy: entrepreneurial university model, networking as an important instrument of leadership control over external resources and the extent of institutional autonomy required for right response to new challenges.

## 2. Methods

The research is based on the descriptive study, focusing on the changes in HEIs, and in particular on studies that compare different governance models. The study examined the model of higher education governance that has evolved through the phase of political transformation and recent period of geopolitical tensions and more intense Europeanization and internationalization. First, the paper deals with the current state of governance research in higher education. In doing so, we used a systemic analysis of commonalities and differences regarding university governance that are perceived as typical for traditional and modern context. Further, we used thematic comparisons based on the following themes regarding governance issues: entrepreneurial university, networking (regional and international), and institutional autonomy. Critical assessment and interpretation of the relevant scientific achievements within the defined problem area offer a conceptual understanding of how governance structure should meet the requirements of university dynamics in the new knowledge based economy.

## 3. Challenges for university governance in knowledge based society

The term “governance” is used to describe all those structures, processes and activities that are involved in the planning and direction of the institutions and people working in tertiary education (Fielden, 2008). It includes external governance, which refers to relations between individual institutions and their supervisors, and internal governance, which refers to the lines of authority within institutions. Universities are traditionally governed by institutional autonomy, individual academic freedom, and collective professionalism (Blaschke, Frost, & Hattke, 2014). Santiago, Carvalho, Amaral and Meek (2006) argue that the loyalty of middle-level academic managers to their disciplines and disciplinary related teaching and research, and even to their departments and faculties, is stronger than their loyalty to their HEI. But this also may place these actors in contradictory roles, caught between the impositions of central management bodies and the collegial interests of their colleagues. As mentioned above, over the past four decades HEIs have faced increasing complexity related to governance. (Kezar & Eckel, 2004). A critical factor in meeting this complexity is in developing effective governance structure that will fulfil the long-term and short-term objectives. Regarding long-term objectives, the priorities are to sustain the core values in research and teaching area and to establish a reciprocal partnership at local, regional and global level. Short-term objectives are connected with the exploitation of current circumstances though integrative operational strategy that includes items such as the allocation of incremental budgets and modifications to the curriculum. Since current decision-making systems (e.g., academic senates, council and other joint administrative-faculty committees) were not created to cope with these types of decisions and demands, a new governance model is needed. Another important factor that caused the governance model restructuring is the changing notion of the societal function of higher education, related to the knowledge-based economy, economic growth and increased attention to the needs of the labour market, with a demand on university staff to change their cultural norms and values accordingly. Knowledge-based society imposes the following themes regarding governance: entrepreneurial university, networking (regional and international), and institutional autonomy.

First theme concerns with knowledge-based entrepreneurship that has emerged as a driving force for economic growth, employment creation and competitiveness in global markets. Interactive research could be seen as a form of joint knowledge formation between practitioners and researchers. In this context, entrepreneurial universities play an important role as both a knowledge-producer and a disseminating institution. Therefore, complex entrepreneurial university model is developed that incorporates the additional role of the commercialization of knowledge and active contribution to the development of private enterprises in the local and regional economy. This means that the entrepreneurial university implements several strategies and new institutional configuration to work together with the government and industries to facilitate the generation and exploitation of knowledge and technology. HEIs have a critical role as intellectual hubs in entrepreneurial ecosystems by serving as incubators for innovation and research, and focal points for collaboration among researchers, students, professors, companies and entrepreneurs. Embedding entrepreneurship and innovation, cross disciplinary approaches and interactive teaching methods all require new models, frameworks and paradigms. In the last two decades, every major report published by international organizations, national governments or researchers stress the necessity of changes towards a new paradigm of “triple helix” mode of university (Etzkowitz, 2013). Governance model suitable for entrepreneurial university should have strong leadership and vision; real student engagement; innovative faculty; and clear evidence of the impact they have made in their local environment. There are a variety of ways in which HEIs can act entrepreneurially. For example, in how they manage resources and build organizational capacity, involve external stakeholders into their leadership and governance, create and nurture synergies between teaching, research and their societal engagement, and how they promote entrepreneurship through education and business start-up support as well as knowledge exchange to enhance the innovation capacity of existing firms.

The second theme regarding knowledge society refers to the importance of regional and international networking of HEI. Regionalization and globalization become complementary phenomena—regions are no longer „provincial“, but gateways into global competition. Knowledge economies need multi-actor solutions and universities provide a venue where local firms meet, collaborate on, and share ideas that ultimately can result in collective regional learning. Connections created among governments, research universities, research parks, business incubators, and technology companies foster new research, technology, and reach new markets. In particular, the university creates alliances with other universities' research labs, government agencies and industries in partnered cities. HEIs operate in regional, national and international networks simultaneously and have to engage with a wide range of different stakeholder groups. One logical consequence of this is the need for a continuous dialogue between the different stakeholders for the overall strategy, because universities have opened up more than before to their partners and external stakeholders. In that process the three particularly important elements for governance are: the capacity for development agencies to support business-university collaboration at a regional level; the role of business clusters in developing business-university networks; the level of business investment in R&D in the region (Lambert, 2003).

The third theme refers to the university institutional autonomy. The extent of autonomy that institutions are allowed by the state is often a mixture of inherited rights, tradition, legislative intent, and societal culture (Fielden, 2008). Thus, a new governance model for the university should reflect these divergent perspectives and respect variety of attitudes, values, and expectations of internal and external stakeholders (Bleiklie, 2014). NPM promoting concepts like organizational autonomy, strategic leadership and management, competition, and accountability. According to Fielden (2008) three types of change have been occurring in HEI: the delegation of powers by the central government to another lower tier of government, delegation to a specialized buffer body, or delegation direct to institutions themselves. The state government prescribes stricter hierarchies, a more powerful chief executive (university presidents/rectors), as well as the introduction of boards of directors (university boards). The university body should be mostly composed of external members and formally involved in decision-making processes at a central university level. The implementation of university boards is part of the politically intended transformation of universities towards a more complete, more autonomous and more efficient organization. (Kretek, Dragšić, & Kehm, 2013). In practice, from the perspective of all organizational members of the university (mostly academic staff and students), the formal establishment of a powerful board is an unwelcome change since it constitutes a disturbance to well-established decision-making processes and internal power balances. Similar conclusion about new institutional autonomy were presented by Bleiklie, Enders, and Lepori (2015). They studied the possible configurations of control in professional knowledge-intensive organizations and their variations. Their work investigated three parallel case studies of universities in three countries. They focused on two dimensions of control: the balance between central control and the participation of professionals; and the importance of formal means of control, like hierarchy and rule systems, vs. informal means like social relationships and normative pressures. Their findings shown that although new governance stresses the virtues of the hierarchical-bureaucratic model, in practice it was mediated by actors on different levels of the field. The control models were associated with power struggles between the leadership and professionals, which are partly contingent on their control of external resources (Bleiklie et al. 2015). In the following part we will use previous findings to develop integrative framework for effective university governance.

#### **4. Recommendation for effective university governance**

Effective university governance is generally assumed to be introduced by new structure that compose of powerful boards and strong leadership. These bodies are gradually becoming more similar to their counterparts in the corporate world with regards to formal authority, composition and roles. There has been a general trend in favor of a managerial model with a smaller number of members and a majority of external nonacademic members. A key principle is that the role of the board is limited to strategic management and that it will need to create a sub-structure of committees to oversee the operational tasks delegated to others (Fielden, 2008). The corporate governance literature recognizes different board roles: *monitoring, service and strategic role* (Babic, 2015). Additionally, the important part of research is dedicated to CEO–board relations with a variety of labels, including power, control, involvement, and vigilance, among others (Boyd, Haynes, & Zona, 2011). Theoretical perspectives used to examine CEO–board relations include: agency, resource dependence, upper echelons, stewardship, social network, and institutional. Social network theory contributes to the area of governance research with respect on board interlocks. Hence, the board interlock network is seen as the most important channels for the positive spillover effects, which include acting as a source of information about organizational practices and reducing dependencies on resource providers (Babic, 2015). Boyd et al. (2011) suggested that through cooptation of directors, the dependent organization relaxes constraints upon the flow of valued resources, by socializing members of the resource provider or by exchanging other valuable goods, such

as status, friendship, or information. Researchers have also found that interlocking directors can play an important role in disseminating information, in reducing vertical coordination and scanning costs and in serving as a mechanism for the diffusion of innovation (Hillman & Dalziel, 2003). We recommended this framework for defining different board roles in university governance (see Table 1).

Table 1. Theoretical perspectives on CEO-board relations.

|                                   | <i>Key concepts</i>  | <i>Key ideas</i>  | <i>Prediction</i>  |
|-----------------------------------|--|---|--|
| <b>Agency Theory</b>              | <i>Principal, agent, self-interest, opportunism, risk, control</i> | <i>Board's role is to monitor the management and use compensation to align the interest of the principals and of managers.</i>  | <i>Incentives pay aligns the interest of shareholders and managers. CEO duality and insider dominated boards increase the potential for opportunism.</i> |
| <b>Resource Dependence Theory</b> | <i>Resources, linkages, power, interlocking.</i>                   | <i>Organizations use internal resources to gain access to scarce resources. Boards use social and human capital to provide: advices; legitimacy; information; access to resources</i> | <i>External members through social ties enhance the provision of advice from outside members on strategic issues</i>                                     |
| <b>Upper Echelons Theory</b>      | <i>TMT cognition, behavior, group, process</i>                     | <i>Strategic choices are a function of managerial cognition and interpretations. Performance is influenced by the decision made by the TMT.</i>                                       | <i>Focus on the characteristics of an overall group will have stronger predictive power than focus on individual members.</i>                            |
| <b>Stewardship Theory</b>         | <i>Steward, principal, delegation</i>                              | <i>Stewards are motivated to act in the best interest of their principals.</i>  | <i>Empowering and enabling governance structures enhances opportunities for achievement and self-actualization.</i>                                      |
| <b>Institutional Theory</b>       | <i>Institutions, legitimation</i>                                  | <i>Organizations are influenced by their institutional context. Legitimacy increases the probability of survival. Board is a primary mechanism to gain legitimacy.</i>                | <i>Board structure and behavior respond to external institutional pressures; standards of best practice implemented.</i>                                 |
| <b>Social Network Theory</b>      | <i>Social network, organizational network</i>                      | <i>Organization is influenced by social networks of external contracts.</i>   | <i>Board's interlocks with third-parties enrich the endowment of resources and information.</i>  |

Source: Adapted from Boyd, B. K., Haynes, K. T. & Zona, F. (2011) *Dimensions of CEO-Board Relations*, *Journal of Management Studies*, 48:8, pp. 1892-1923, pp. 1897-1900o

Board effectiveness is seen as the degree to which boards are successful in carrying out their roles. Prior research in business sector suggests that the board's roles may be explained via two different perspectives – a passive and an active one. According to the passive perspective, the role of the board is to represent the interest of the owners and steer management decision-making process. On the other hand, the active perspective suggests that boards are looking to add long-term value through the implementation of well-defined strategy in a competitive and changing world. In this context, the board should have appropriate *competency profile* that consists of three basic types of competencies: *personal/interpersonal; governance competencies and specific competencies* (technical and strategic) (Babic, 2015). Another concept that is useful for effective governance is board capital introduced in the strategic management literature by Hillman and Dalziel (2003) as the sum of the human and social capital of the board. Similarly, several studies have demonstrated the importance of board's human and social capital (Kor & Sunduramurthy, 2009; Sunduramurthy, Pukthuanthong, & Kor, 2014). Further, Nicholson and Kiel (2004) developed a holistic framework for examining how boards affect institutional performance. The basic premise of their framework is that an effective board will have an effective fit between the various elements of its intellectual capital in light of the roles required of it. The authors viewed the construct of “intellectual capital” to be the core of the transformational processes through which a board adds value to an organization (Keil, Nicholson, Tunny, & Beck, 2012).

## 5. Conclusions

The knowledge-based economy posture new requirements to HEIs that means more flexibility to make their own decisions, in order to be able to implement agile management of resources and create efficient, responsive, and innovative organizations. In this process, universities as institutions, as well as the individual academics who work within them, need to become more active players in the so-called “triple helix” of government, business and higher education institution relations. In addressing the second research question we stress the importance of regional and international networking and their impact on the development of societies and communities, both locally and regionally as well as nationally and

internationally. The key task of the new university governance is to produce a synthesis through which the institution not only responds to regional needs but also becomes a motor for regional development. The third issue of the university governance include the implementation of new approaches to institutional management. Effective university governance is generally assumed to be introduced by new structure that compose of powerful boards and strong leadership. While the results of the study contribute to the governance of HEI literatures, there are some limitations of the research. First, the theoretical character of the study is not enough for the sound conclusions. Thus, it is necessary to conduct some empirical research of the problem of board competencies, board capital and CEO-board relationship. Second, the measures of board capital are still not developed in a way that could isolate human from social dimensions. Third, the majority of theoretical and empirical studies were conducted in Western economies and their results could not be implemented in different institutional context. Further research of new university governance systems should comprise two strategic priorities – excellence in providing research, teaching and services and at the other side professional management of human resources, investment and administrative procedures. Achieving and maintaining these features may have significant implications for institutional design in the future.

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# A RESEARCH ON THIRD-PARTY WORD-CLASS UNIVERSITY EVALUATION INSTITUTIONS IN CHINA AND ALL AROUND THE WORLD

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## Abstract

With the continuing development of higher education internationalization, economic globalization, and global science and technology, many countries including China are building up World-Class Universities (WCU) in succession. To ensure the anticipated compliance and effects of related policies, evaluation is becoming more and more important for WCUs. Contrasted with government and university level evaluation, third-party evaluation is gaining more favor because of its various evaluation forms and external evaluation bodies.

In use of mixed research design combining quantitative statistics study and qualitative content analysis, this research analyses four types of third-party world-class university evaluation institutions worldwide from different kinds of data source. Firstly, the overall counts and distribution of the institutions are analyzed at macro level. Then evaluation standards and systems of institutions are analyzed at micro level. Based on that, we present and illustrate the developing situation of evaluation counterparts in China and compare it with global mature cases.

Through the research, it is identified that the four types of evaluation institution, university alliance, university ranking, university evaluation and subject accreditation institutions, are different in terms of evaluation standards, subjects, methods and frequency. Institutions in different countries and regions also have different development levels. In the case of China, university ranking is becoming mature, while subject accreditation and university alliance institutions are still lagged behind by some developed countries. It is noteworthy that university evaluation institutions in China are the most undeveloped type among all the four types and have a long distance compared with developed countries including the US, the UK and Japan.

This research chooses third-party world-class university evaluation institutions as a research target, which enriches the range of research and expands it to third-party evaluation in higher education. We have collected a list of global third-party world-class university evaluation institutions. Moreover, we have also studied several case institutions in depth. By doing the comparison, we have found some problems and challenges of third-party evaluation situation in China. In conclusion, this research has proposed several pieces of available suggestion about how to build up third-party WCU evaluation institutions in China, including suggestion about top-level demand, number of different kinds of evaluation institutions and development directions of different evaluation institutions. It is our genuine hope that it can shed some insight in this area and provide some instructions for the future key policy measures as well as projects to speed up the process of world-class university building in China.

**Keywords:** *World-class University, Third-Party Evaluation, University Ranking, University Alliance.*

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## 1. Introduction

As the pinnacle of higher education pyramid, world-class universities are the main part of national strategy of science, technology and innovation system(Altbach, 2004). There has been a trend to evaluate WCUs(Craft, 2003). Compared with first-party and second-party evaluation, third-party evaluation has more forms and autonomy(Astin & Antonio, 2012; Vaidyanathan, 2005). Nowadays, there are many third-party evaluation institutions promoting evaluation work for world-class universities and world-class subjects. For example, successful cases include AAU established by top research universities in the US and Canada, ARWU published by center of world-class universities in SJTU, JUAA serving for educational quality promotion of Japanese universities, and AACSB offering accreditation service for business schools in over 90 countries(Liu & Cheng, 2005). These institutions have integrated evaluation

standards, scientific evaluation methods and sufficient influence in local and international range(Bonaccorsi & Piccaluga, 1994).

Compared with mature third-party evaluation institutions in the world, institutions in China still have some problems including later starting time, not enough specialty and independence, too much coerciveness and administration. Several Chinese third-party institutions concentrate on official and semi-official duties. To build up WCUs in China better, Double Top Project has explicitly stipulated the introducing and developing third-party institutions to evaluate the quality of subjects, majors and courses. Based on the background above, this research aims to analyze outstanding third-party evaluation institutions all around the world and compare them with Chinese institutions, then propose some feasible advice for Double Top Project in China.

## 2. Design and methods

Firstly, we collect and filter different types of third-party world-class university evaluation institutions worldwide from different kinds of source, by means of mixed research design combining quantitative statistics method and qualitative content analysis method. Then, the number and distribution of institutions are analyzed at macro level. After that, evaluation standards and systems of case institutions are focused at micro level. At last, we analyze the developing situation of evaluation institutions in China and compare it with global mature cases.

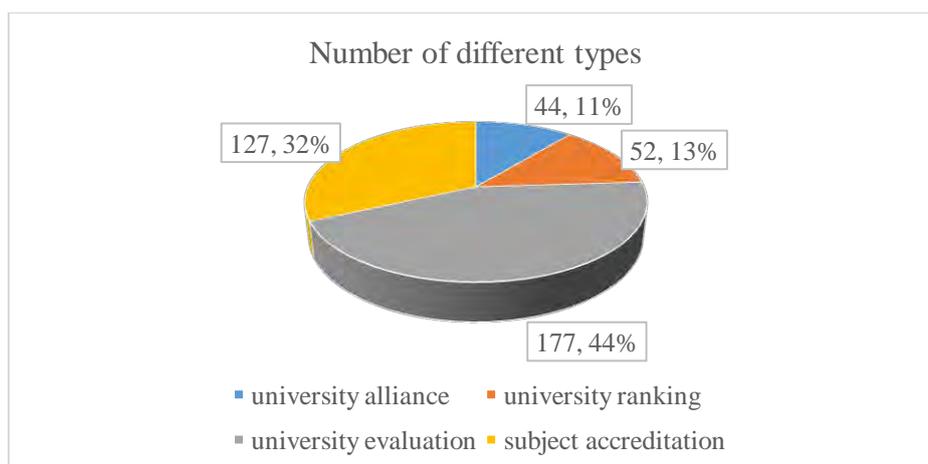
We intend to use mixed research design to finish this research. When analyzing the whole condition and distribution of third-party institutions worldwide, quantitative statistics method is in use. When analyzing the evaluation standards, we also apply the quantitative method(Patton, 1990). When analyzing the evaluation systems, however, we mainly use qualitative content analysis method. At last, we wrap up the several parts and get the conclusion.

## 3. Content

### 3.1. Distribution of third-party WCU evaluation institutions worldwide

According to different sources including national and international accreditation agencies for evaluation institutions as well as academic literature, we get a rough number of 400 related institutions. Third-party WCU evaluation is defined as evaluation work for world-class universities and subjects promoted by social organizations and institutions apart from universities and governmental agencies(Westerheijden, Stensaker, & Rosa, 2007). All the 400 institutions can be divided into four types containing university alliance, university ranking, university evaluation and subject accreditation institutions. Distribution of the four types can be seen from Figure 1.

Figure 1. Distribution of four types of third-party WCU evaluation institutions.



Based on the total sample, 25 representative outstanding evaluation institutions are selected as research cases. These cases are located in key WCU supported countries like the US, Japan and the UK. They have explicit independent status compared with the government and universities. What is more, most of members in these cases have world-class level and the institutions themselves have got abundant research experience and influence at home and abroad. The basic information of case institutions is below.

Table 1. Basic information of case WCU evaluation institutions.

| Types   | University alliance                         | University ranking                    | University evaluation                | Subject accreditation                   |
|---------|---|---------------------------------------|--------------------------------------|---|
| Number  | 7   | 6                                     | 6                                    | 6                                       |
| List    | AAU, Russell, IARU, LERU, BIG TEN, Go8, U15 | ARWU, THE, QS, CAAA, USNEWS, Guardian | Carnegie, JUAA, IEP, QAA, WSCUC, AQA | ABEST21, AAC SB, CEA, LCME, ABET, ASIIN |
| Range   | 50% international, 50% national             | 50% international, 50% national       | 17% international, 83% national      | 83% international, 17% national         |
| History | 24 years                                    | 17 years                              | 20 years                             | 52 years                                |
| Members | 22  | 520                                   | 284                                  | 1300                                    |

### 3.2. Evaluation standards and systems of third-party WCU evaluation institution cases

Evaluation standards are the basis of evaluation activities in third-party institutions and the key factor to determine evaluation results (Geuna & Martin, 2003). In this research, we analyze standards through five functional dimensions including teaching, research, service, internationalization and reputation, and organizational management (Stufflebeam, 1971). In detail, teaching indicator refers to talent training, teaching faculty, student source and teaching facilities. Research indicator refers to scientific research funding, outcomes, research quality and support. Service indicator refers to social activities, economic income, national project support, and achievement transformation. Internationalization and reputation indicator refers to overseas students, international faculty, global cooperation projects, university ranking and global impact. Organizational management indicator refers to university internal quality assurance system, resource allocation, organization structure and financial policies. Furthermore, standards are also divided into input indicators and output indicators. Input indicator refers to funding, teachers, policies, student sources. And output indicators refers to paper output, graduates, and international ranking (Sadlak & Liu, 2007). The table below presents the overall evaluation standards of WCU institutions.

Table 2. Overall evaluation standards of case WCU evaluation institutions.

| Type  |                                     | University alliance | University ranking | University evaluation | Subject accreditation |
|---|-------------------------------------|---------------------|--------------------|-----------------------|-----------------------|
| Number of indicators                          | Number of first level indicators    | 3.0                 | 5.0                | 5.0                   | 7.7                   |
|   | Number of second level indicators   | 8.3                 | 9.5                | 16.0                  | 31.8                  |
| Proportion of different functional dimensions | Teaching                            | 28.3%               | 52.2%              | 39.6%                 | 54.0%                 |
|   | Research                            | 47.9%               | 36.3%              | 14.9%                 | 4.9%                  |
|   | Service                             | 10.4%               | 6.2%               | 5.5%                  | 1.5%                  |
|   | Organizational management           | 0%                  | 1.7%               | 36.7%                 | 37.3%                 |
|   | Internationalization and reputation | 13.5%               | 3.7%               | 3.2%                  | 2.4%                  |
| Proportion of Input /Output                   | Input                               | 51.5%               | 36.8%              | 86.6%                 | 96.3%                 |
|   | Output                              | 48.5%               | 63.2%              | 13.4%                 | 3.7%                  |

Apart from evaluation standards, evaluation system of third-party institutions has multiple components including evaluation subject, evaluant, principle, content, method, procedure and result (Otley, 1999). These elements constitute key segments of evaluation process along with evaluation standards (Shin & Kehm, 2012). The table below sums up elements of four types of third-party institutions.

Table 3. Evaluation elements of third-party institutions.

| Type             | University alliance  | University ranking  | University evaluation  | Subject accreditation   |
|------------------|--|---|--|---|
| Subject          | Board of directors, presidium and principal assembly of member universities                      | Most are medias, minority are educational institutions and consulting firms     | Evaluation committee and review committee  | Accreditation committee   |
| Evaluant         | Research universities  | Universities on a global scale  | Research universities  | Department and subject projects   |
| Principle        | Scale and quality  | Objectivity, focus on key university functions, evaluation after classification | Objectivity and reality, self-evaluation and academic standards                  | Not much mentioned, in the light of subject features                            |
| Content          | Evaluation of initiation, existence and performance measure                                      | Various objective indicators, peer review and student satisfaction              | Judgement of membership  | Whether to meet accreditation standards   |
| Method           | quantitative statistics with peer review   | Quantitative statistics with questionnaire survey                               | Field visit, self-evaluation and peer review                                     | Self-evaluation, field visit and peer review                                    |
| Procedure        | Half use regular data statistics, half use quantitative and qualitative comprehensive assessment | University classification, indicator and total score calculation, rank ordering | Starting from self-evaluation report, field visit, peer review, final evaluation | Identifying qualification apply, self-evaluation, filed visit, final evaluation |
| Result           | Most use web data and text, minority use annual report   | Web public, total ranking, indicator and total score                            | Evaluation score at each stage, final decision of membership                     | Decision of accreditation   |
| Member stability | Low  | Annually  | Four or five years for a cycle   | Low, irregularly  |

### 3.3. Comparison between institutions in China and case institutions

Among all the 400 third-party WCU evaluation institutions, 109 institutions are in the US, but only 17 institutions are from China. Most are educational evaluation institutions. Some are higher education institutions and consulting firms. In this research, C9 is selected as a university alliance case, ARWU and CAAA as two university ranking cases, which are mature enough compared with global level. As for university evaluation type, 21 Century Education Research Institute, MyCOS Company and Shanghai Education Evaluation Institute have not carried out systemic third-party evaluation for WCUs. So no university evaluation institutions are selected in this research. We choose CEEAA, CDGDC and CAMEA as three subject accreditation cases.

Evaluation standards in China's institutions are not as rational as that of global cases. Indicators are less and focus more on certain aspects like dominant and amount indicators. Institutions in China are not in favor of process evaluation compared with global cases especially in the US and the UK. As for evaluation system, different institutions in China have different developmental level. University ranking and subject accreditation institutions have more mature and integrated systems than university alliance and university evaluation ones. Overall, third-party WCU evaluation institutions in China still have a distance with global mature cases.

#### 4. Conclusion and discussion

Through this research, we find that university alliance, university ranking, university evaluation and subject accreditation institutions are different in terms of evaluation standards, subjects, methods and frequency. Teaching, research and organizational management indicators are more abundant compared with service and internationalization indicators. Peer review, field visit and self-evaluation methods are the main evaluation methods. Institutions in different countries and regions also have different development level.

In the case of China, university ranking is quite mature, while subject accreditation and university alliance institutions still have a distance with developed countries. It is noteworthy that university evaluation institutions in China are the most undeveloped type among the four and have a long distance compared with developed countries including the US, the UK and Japan.

Meanwhile, we have found some problems and challenges of third-party evaluation in China. Through summary and contrast, this research has proposed several pieces of available suggestion about how to build up third-party world-class university institutions in China. The suggestion includes top-level command, the number of different kinds of evaluation institutions and specific development directions of different evaluation institutions. Firstly, competent department should offer more support and encourage different types of institutions to develop. Secondly, we need to reform existing university alliance institutions to build up platforms for different regions and different kinds of universities. Thirdly, subject accreditation institutions should conform to international trend to increase specialty and influence. At last, China must take advantage of the power of research organizations and consulting firms in higher education decision area to from and develop third-party university evaluation institutions. We hope to provide instructions for the coming key construction projects to speed up the process of world-class university building.

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## DEVELOPMENT OF FINTECH AND IMPORTANCE OF FINANCIAL EDUCATION<sup>1</sup>

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### Abstract

Recently entry of enterprises related to Financial Technologies (Fintech) to financial services industry is remarkable. When Fintech enterprises started to enter financial services industry, many traditional financial institutions saw them as a competitor. Moreover, some might say Fintech would break a traditional financial services, financial institutions, and financial markets. But on the contrary, many traditional financial institutions, for example banks, securities companies and insurance companies actively invest and introduce Fintech and Fintech related startups. Now in any cases, traditional financial institutions don't think Fintech competitor, rival or enemy as they thought before. They use Fintech a tool to develop new markets, new customer, and existing customer.

In addition, Cyber security and Fintech are actual and interrelated topics, which shall to be researched and analyzed further. Innovations of the financial services lead to the reduced cost, improved timeliness, along with the introduction of many new services and products. However, there are many barriers and uncertainty regarding their success and rate of adoption, in relation to the cyber security, privacy, and regulatory issues. Many of the legal issues of the Cyber security in the context of Fintech are still unknown or in other words – legally uncertain. Finally, the challenge in the Fintech is how to capture innovation while preserving the stability of the banking network.

Regarding users of Fintech, accessibility or convenience of financial transaction has improved because of the development of Fintech. But at the same time, possibility to be a victim of financial crime or fraud has grown. Moreover, users themselves might make a perianal mistake. In fact, many frauds related to Fintech have happened in China in these years. So, we can say, the education to develop financial literacy and information literacy is one of the most important topics in modern education system.

**Keywords:** *Fintech, Cyber security, financial education, financial literacy, Information Literacy.*

### 1. Introduction

In these days, many enterprises related to fintech were established in many countries. Fintech means new information technologies that enable IT enterprise or traditional financial institutions to serve individuals new financial service using new IT. Fintech or fintech-related companies were used to be supported by leading IT companies such as Google, Amazon, Apple and Facebook and investors such as in Silicon Valley in U.S. And now, they spread worldwide.

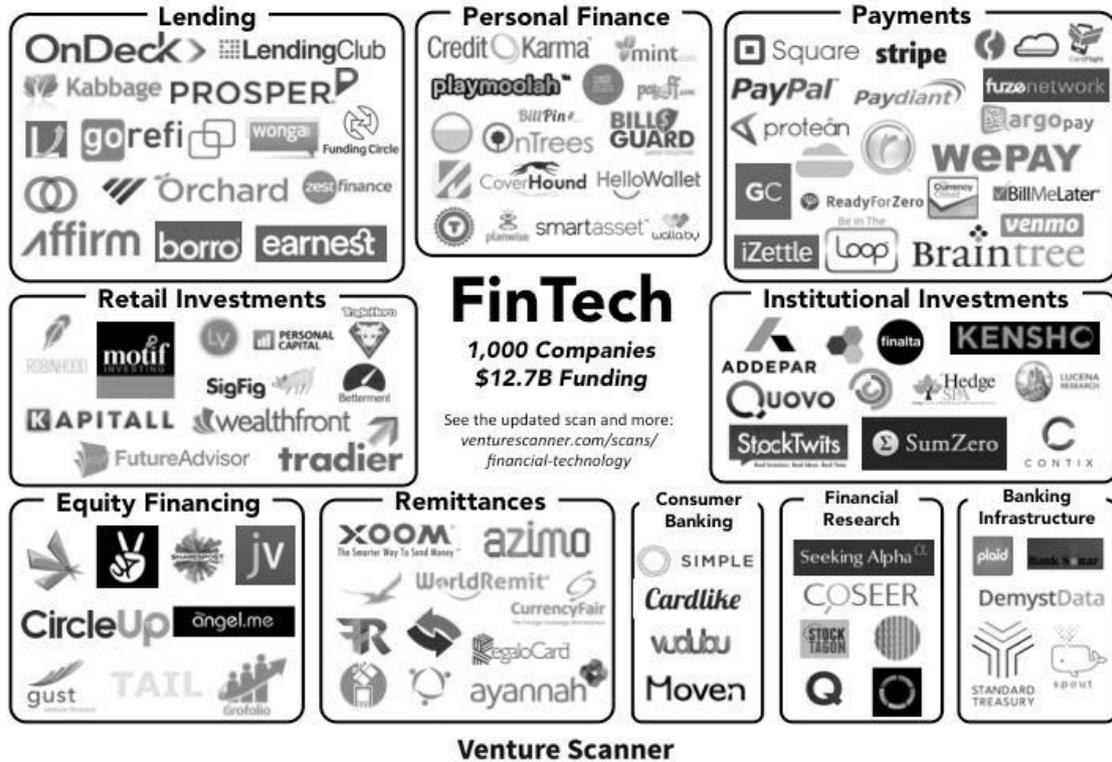
Spread of Fin-Tech was related to the global financial crisis from 2008. Since this crisis, world economy has experienced recession for long times. In this situation, profit of financial enterprises especially small-and medium-sized enterprises (SME) declined seriously. So, even though there were enough demand and market for lending, lenders moved to curve new loans. But IT enterprises which have enough capital saw this situation a good chance to enter into financial services industry, and actually entered as fintech enterprises. After that, Fin-Tech can be seen in various fields of financial services industry, and now many traditional financial institutions invest fintech companies actively and absorb fintech in a strategic way.

But there are some serious issues to solve. One is about financial and IT literacy of fintech users (individuals). Fintech made financial service easy to be used by individuals, but if users didn't have enough literacy of financial literacy, they would make mistakes such as over-borrowing or encounter to financial fraud. And the other is cyber security regarding Fintech. Technologies that used in Fin-Tech are

<sup>1</sup>This paper is a revised version of Yanata et.al(2016)

mainly related to internet and fields where Fin-Tech entered is financial services industry, so to heighten Cyber security technically and regally is seriously needed. So, we can say that financial education containing IT skill education related to Fintech is important.

Figure 1. Markets of Fintech.



(Source) venture scanner (<https://www.slideshare.net/NathanPacer/venture-scanner-fintech-report-q1-2017>)

## 2. Security of Fintech

The fintech became one of the most researched topics in the last couple of years disrupting the status quo of traditional banking, modernizing old institutions, and changing the way consumer's access financial products and services. Similarly, may be witnessed constant development of hardware and software of the technology, which supports fintech products and services. The growth in importance of wired and wireless data transfer, the emergence of big data and cloud computing services, and the take-over by smart phones of increasingly more human communication functions and other functions important to people mean that information technologies play an increasingly more important role in our lives. Dependence of human activities on information technologies will only increase in the future. Information technologies are also common in providing fintech services. Technological achievements are developing in a very dynamic manner, this also influences possibilities to have an adverse impact, and therefore, the issues related to Cyber security become increasingly more important.

More and more countries have become some kind of victims of Cyber-attacks on the one hand, and have realized the seriousness of Cyber-attacks and the importance of Cyber security on the other hand (Ventre, 2015). The concept 'Cyber security' emerged in the 1990s, when the increasing dependence of the public on the development of information technologies was observed. Cyber security is associated with the creation and maintenance of processes related to the identification of emerging Cyber threats and costs for the application of reasonable countermeasures (Shoemaker and Conklin, 2012). Cyber security is not an isolated objective, but rather a system of safeguards and responsibilities to ensure the functioning of open and modern societies (Klimburg, 2012), also it's a precondition of sustainable fintech ecosystem. In the fintech as the relationship between technology and financial services deepens, also grows the threats posed by increasingly sophisticated hackers. The report, implemented by PWC revealed that 45% of financial services respondents reported to have been affected by cyber-crime). As digital technology and financial services currently become inter dependent, cyber security is one of the key challenges for the Fin-Tech environment. It is clear that if fintech service providers seek to be successful, they have to obey the rules of cyber security regulation environment. This is the only one way to satisfy the expectations of

the customers. Despite the increasing effort put in ensuring cyber security, the level of cyber security in individual countries differs significantly. The differences were shown in a BSA report (BSA, 2015). Research carried out reveals that the situation in terms of cyber security is different in the EU member states because of differences in the applicable cyber security strategies, requirements for cyber security audits, and incident reporting requirements (BSA, 2015). Discrepancies can be seen both in the cyber security culture and in documents that regulate cyber security.

### **3. The Link between Technological Development and Financial Education**

There is a tendency for the financial education to be improved constantly. The rapid growth of Internet technologies and spread of the online services cause the dramatic change in the financial behavior of the end-users. The same issue was emphasized in the report on financial education of the Deputy Governor of a Bank of Japan Kikuo Iwata on January 23, 2015: Financial education in Japan: Challenges presented by aging population and declining birthrate. A wide range of income may be placed on the credit cards and variety of transaction may be implemented in the online banking environment. Therefore, it is important to analyze the possible risks appearing in the online banking environment and to describe the measures for prevention of such risks. In addition, and more important, such prevention measures in the online banking environment need to be included into financial education.

Online financial transactions do not create fresh peril groups, but to a certain extent draws attention to the risks that several monetary establishment faces (Michael and Herbert, 2009). Referring to the Olufolabi Osunmuyiwa (2013), the possible risks in online banking environment include transactional, compliance, reputation and risks associated with information security. Transaction risk creates difficulties for individuals and corporations dealing in different currencies, as exchange rates can fluctuate significantly over a short period of time. Compliance risk is the risk related to the violations or nonconformance with, laws, rules, regulations, prescribed practices, or ethical standards. According to Virender Singh Solanki (2012), reputational risk is the risk of getting significant negative public opinion, which may result in a critical loss of funding or customers. Risks associated with information security are referred to the risks arising due to negligent data safekeeping procedures, consequently revealing the organization to scam, information obliteration, viruses, information thieves, vicious hacker, insider assaults and Denial-of-Service (DoS) attacks. The particularly challenging issue is protection of privacy issues of account holders' in online banking environment. Referring to the technical report, made by the University of Cambridge (Matthew Johnson, 2008) privacy issues are involved in almost all the vulnerabilities of online banking. For example, most vulnerable privacy issues are related to the online verification, transaction snooping, shoulder surfing (Matthew Johnson, 2008, P. 17) and phishing (Matthew Johnson, 2008, P. 16, 17 and 32). In addition, other scholars identify distinct online banking risks, such as money laundering risks, strategic risks, foreign exchange risks, price risks etc. However, this theses focuses more on the financial education and therefore for us it is more important to reveal that the described current risks and the prevention measures in the online banking shall be included into financial education.

It was already stated that due to the developing technologies, the number of modern risks in online banking has increased and the prevention measures shall be taken. Prevention measures in the online banking environment are important, because consumers refer to the security and reliability as a priority in digital world. Security issues are major barriers to internet banking and e-commerce activities among consumers (Khasawneh, 2009). Particular prevention measures in online banking include protection of information, constant monitoring, firewalls and cookies, appropriate identification and similar. However, it is important to note here that all these protection measures will be effective only when it will be the appropriate financial education about possible risks and the ways of avoidance such risks. In the opinion of authors, the minimum set to be included into the financial education shall consist of: an explanation of online banking possible risks; an explanation of the protections provided; the suggestions for online banking customers to perform a related risk assessment and control evaluation periodically; a list of available resources where such information can be found; and, list of appropriate contacts for online banking customers' in the event they notice suspicious account activity. It should be noted that the described set shall constantly be revised due to the changes of the newly appeared online banking risks.

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## **NOT THE “FRENCH-FRENCH”: ISSUES OF INCLUSION AND IDENTITY FOR NON-EUROPEANS AFTER CHARLIE HEBDO**

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### **Abstract**

Just over three million people who live in France ranging from 18 to middle age are second generation immigrants, many of North African descent. Non-Europeans of African descent, attempt to belong in French society, however, they are perceived as having greater cultural distance and less ability to integrate than their European immigrant counterparts. The goal of this case study was to explore and contribute to a temporal understanding of the lived experiences of three female Algerians of non-European descent who are first-generation college students and citizens of France. Data from surveys, interviews, and field notes were collected over a period of year. Cross-case analysis was employed to identify recurrent themes and patterns. Findings revealed that the challenges of inclusion and upward mobility for non-Europeans continue to exist and are exacerbated by recent events such as Charlie Hebdo. Participants reported issues of inequitable schooling practices, marginalization, integration with immigrants, and an increased intolerance for those seen as “foreigners”. Conversely, participants refer to the benefits of “positive discrimination” (government legislation) which has led to increased opportunities for the less advantaged to attain access to a university education. Implications for social, educational, pedagogical and curricular inclusion approaches are also addressed.

**Keywords:** *Algerian, France, integration, inclusion, Charlie Hebdo.*

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# TRANSFORMATION AND SOCIAL JUSTICE CHALLENGES FACING SOUTH AFRICAN HIGHER EDUCATION

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## Abstract

### Background

2015 was the year of the student in South Africa. It all began with the Rhodes Must Fall Campaign (#RMF) at University of Cape Town and this escalated into issues of transformation, educational access and reform – bringing higher education to a halt in the country with the #fees must fall campaign. The # fees must fall campaign has evolved into a severe national crisis.

Equal opportunity in entry to education is an important concern in relation to social justice, particularly as education is associated with economic outcomes, democratic participation and personal well-being. The issue in South Africa was more than simply equal access to education it was inspired by the idea of intellectual decolonization and re-orientation of South African higher education. At a time of crisis one needs to understand certain important aspects firstly, in analysing the role of universities in social transformation there is a need to draw a distinction between the pre- and post-Apartheid periods; the former focuses on practices of resistance to the Apartheid regime and the latter on constituting a democratic polity in part by addressing Apartheid legacies. The second draws attention to the unintended consequences of Government policy.

### Aim

The issues addressed here discuss the central questions about the value, role and control of higher education: Who pays for higher education? Who benefits? Who decides who should benefit, what should be offered, and what the outcomes should be?

### Objectives:

- a) To explore the challenges and possibilities related to addressing the issues of transformation in various institutions.
- b) Inform future policy and practices around the higher education regulatory environment which influences adult learning.

**Keywords:** *Access, Equity, Funding, Policy and Transformation.*

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## 1. Introduction

As enumerated by the Committee of Economic, Social and Cultural Rights:

*“Education is both a human right in itself and an indispensable means of realizing other human rights. As an empowerment right, education is the primary vehicle by which economically and socially marginalized adults and children can lift themselves out of poverty and obtain the means to participate fully in their communities.”<sup>92</sup>*

*(UN Committee on Economic, Social and Cultural Rights (CESCR), General Comment No. 13: The Right to Education (Art. 13 of the Covenant), 8 December 1999, E/C.12/1999/10.)*

In South Africa there is a serious disjuncture between institutional policies and real-life experiences of staff and students. The relevance of this presentation is therefore to address the systemic challenges in substantively transforming the higher education system. This paper draws on research in the public domain, particularly, the work of the Ministerial Committee into Transformation and Social Cohesion in Higher Education (MCTHE), it provides an outline of the transformation and social justice debate, a summary of the steps already taken with respect to transformation by government and then looks at the central challenges confronting the system. This is followed by a discussion of the issues underpinning this challenge and concludes with suggestions for a way forward.

## 2. Background

The statement that transformation and social justice principles and interventions in higher education become more urgent but also vulnerable in these challenging times is a cliché that is likely to reveal some form of consensus. We need to check - is there is a common set of understanding of what is actually happening in higher education and what constitutes social justice and what has been the transformation agenda. There is the notion that higher education today relates to knowledge societies and economies in the global world. Higher education institutions are regarded as central to economic and social development for the country.

During apartheid there were 36 higher education institutions serving different race and ethnic groups. Following a comprehensive restructuring process these 36 institutions were merged to form 23 institutions. (CHE 2004). The policy context changed rapidly and explicitly supported increasing and broadening access to university study as one aspect of a strong focus on the redress of past inequalities (Cloete 2002). This commitment to equity and access was reflected in policy documents of the time (MoE 1997, 2001) and continues to be emphasised in more recent policymaking (DHET 2011; NPC 2011). The changing policy environment has translated into many visible changes in the sector. In terms of increasing access/participation (massification), the headcount enrolment in South African higher education increased from 394,700 in 1990 to 892,943 in 2010 and to 983 698 in 2013. Despite these gains, when we look at proportional representation or participation rate per population grouping (equity as inclusion) as per Table 1. Further, national cohort studies showed that while 44 % of white students completed a 3 year bachelor's degree in minimum time, only 16 % of African students did so. After 6 years, only 41 % of African students had completed a three-year degree (CHE 2012, p. 51). The sector thus remains plagued with skewed participation and very high dropout, with many students exiting the system with no qualification but having accumulated debt (DHET 2010). The government's first initiative was to appoint a National Commission on Higher Education (NCHE) in 1995. The NCHE reported in 1996. This report, *an overview of a new policy framework for higher education*, identified the challenges and opportunities in the existing system and made a number of recommendations. Central amongst these was the proposal that South Africa should seek to establish a single, coordinated, national system of higher education premised on a programme-based definition of higher education (NCHE, 1996).

Table 1. Headcount enrolments in public higher education by race, 2008 to 2013.

|          | 2008    | 2009    | 2010    | 2011    | 2012    | 2013    | Population 2013 |
|----------|---------|---------|---------|---------|---------|---------|-----------------|
| African  | 515 058 | 547 688 | 595 963 | 640 442 | 662 123 | 689 503 | 42 284 132      |
| Coloured | 51 647  | 55 101  | 58 219  | 59 312  | 58 692  | 61 034  | 4 768 172       |
| Indian   | 52 401  | 53 629  | 54 537  | 54 698  | 52 296  | 53 787  | 1 329 302       |
| White    | 178 140 | 179 232 | 178 346 | 177 365 | 172 654 | 171 927 | 4 602 388       |
| Total    | 799 490 | 837 779 | 892 943 | 938 200 | 953 373 | 983 698 | 52 981 991      |

Source: Council on Higher Education. Participation data. 2016

## 3. Policy Formulation

White Paper 3 (WP3) remains one of the most important policy statements of the new government with respect to higher education. Its major objectives were spelt out as follows:

- Promoting equity of access and fair chances of success to all, while eradicating all forms of unfair discrimination and advancing redress for past inequities.
- Meeting, through well-planned and coordinated teaching, learning and research programmes, national development needs ... [for] a growing economy operating in a global environment.
- Supporting a democratic ethos and culture of human rights....
- Contributing to the advancement of all forms of knowledge and scholarship, and in particular addressing the diverse problems and demands of the local, national, southern African contexts and upholding rigorous standards of academic quality. (WP3, 1997: 14)

However, implementing these policies has proven to be a slow, arduous and ambiguous process; impressive gains sit alongside old patterns reproducing themselves both within the higher education sector and in the relations between this sector and society. While WP3 and the process of discussion surrounding it provided the Higher Education Act of 1996 with its essential character, the expected 'massification' of the higher education system, as Jansen (2002) points out, did not occur. Some expansion occurred in mostly formerly white higher education institutions which were, in any event,

already positioned to expand their market share in the mid-1990s. Beyond this development, growth was limited (Jansen, 2003).

The NPHE was intended to provide the blueprint for the radical reform of the higher education system. The key focus of the plan was on the achievement of equity, informed by the WP3's vision of promoting "equity of access and fair chances for success", "eradicating unfair discrimination" and "redressing past inequalities" (WP3, 1997: 1.14):

- To ensure that the staff and student profiles progressively reflect the demographic realities of South African society
- To ensure that the race and gender profiles of graduates reflect the profile of student enrolments
- To increase the participation, success and graduation rates of black students in general and African and Coloured students in particular
- To increase the representation of blacks and women in academic and administrative positions, especially at senior level" (NPHE: 2001 35).

So much of the new plan was implemented. New initiatives were established – CHR/NRF/HEQC. Today, 21 years after the demise of the apartheid system, higher education has shifted, in its structural characteristics, from a fragmented and structurally racialized system of 36 public and more than 300 private institutions in 1994 to a relatively (at least formally) more integrated system of 26 public universities (traditional, comprehensive and universities of technology) and 95 private higher education institutions in 2015 (see Blom, 2015).

The Higher Education (HE) Sector is intended to perform the following three functions as outlined in the National Development Plan (NDP: a) Educate and equip people with high-level skills to meet the employment needs of the public and private sectors; b) produce new knowledge and assess and find new applications for existing knowledge; and c) provide opportunities for social mobility while strengthening equity, social justice and democracy to deal with the injustices brought about by the post-apartheid system.

#### **4. Translating National commitment to Practice – what are the challenges?**

Post-1994 landscape for transformation in South Africa became a debatable issue. In the main, it can be argued that it mostly reflects the values and goals repeatedly conveyed during the freedom struggle: to overcome the legacies of racism and exploitation. Yet the content of these are variously debated. Gradually though a minimal consensus shows signs of emerging to address the material "backlog", the material and psychological poverty suffered by the majority of citizens which disadvantages them in exercising the rights enshrined in the new constitution and accessing the resources available in society. The determined policy changes advocated by the new government in the post 1994 period are a matter of only a few years. Any assessment of the "impact" of higher education on social transformation in this short period is bound to be limited and tentative. This paper suggests that one of the central objectives articulated in the policy remains incompletely addressed, namely, *Student access and student success at university*.

A focus on this issue is important because it contains the unacceptable reality, morally, politically and economically, that in terms of talent and how the system has come to understand talent, that it can actually only take to graduation 5% of the cohort of black children entering school in any one year. This stands in contrast to the situation for white children which is approximately 60%. These statistics contain all the nuances and shades of structural discrimination, the economic and social conditions which have made South Africa the difficult society it is. They speak directly to the fact that while the country has made major strides in some areas of civil life, it has either stagnated or is deteriorating in others. It is true that the country is considerably freer and more open than it was prior to 1994. It has laws and policies that speak to and make the country a constitutional republic with some of the most farsighted understandings of inclusion and exclusion and how discrimination works and might be redressed. With respect to education and access, the country is confronting the reality that while it has extremely good national enrolment figures for schooling, the very value of this schooling has still to be realised for the majority of children in the country. Children are not yet prospering in school.

##### **4.1. Language Policy for Higher Education**

In recognising the reality that language continues to be a barrier of access and success in higher education, the Language Policy for Higher Education ("Language Policy") emphasises that the role of language and access to language skills is "critical to ensure the right of individuals to realise their full potential to participate in and contribute to the social, cultural, intellectual, economic and political life of South African society. The Language Policy noted that the failure of most institutions to promote multilingualism, hampers the creation of an inclusive institutional environment advancing tolerance and

respect for diversity. The Language Policy recognised that English and Afrikaans are the dominant languages of instruction in higher education. The Policy encourages consideration to be given to the development of other languages for use in instruction, but notes that this would require, amongst other things, the development of dictionaries and teaching and learning materials.

#### **4.2. University Culture**

According to Wits, the term “institutional culture” is contested. Wits’ 5 Year ICP defines institutional culture as:

*“[t]he lived experience of the university by all those who inhabit it, including students, academic staff, management, support staff, workers and members of the public who come into contact with the institution. Institutional culture should be understood to encompass the policies and practices (tangible and intangible) that mark the daily and long-term academic, social, cultural and personal experiences of those who share and pass through the university’s everyday practices and spaces.”(Wits 5 year Institutional Culture Plan (2014) p.2 & 6*

The chairperson of the Transformation Oversight Committee, indicated that racism at universities is still pervasive today and referred to a report on Wits which found that 70% of Black staff members felt that the climate of the University was alienating, compounded with racism and hampered advancement. Additionally, he submitted that racism and a failure to transform are closely linked and that a lack of will to transform impacts on the culture of universities, further giving rise to deprivation of access and alienation. A 2012 Climate Survey conducted at University of Cape Town, too, revealed that the culture and climate was alienating to Black students and staff members, which highlighted the need to implement measures to promote inclusivity. Measures such as the development of transformation programmes, induction and leadership training have been undertaken to ensure a supportive and welcoming climate. However, it emphasised that transformation is more than numbers alone, but includes the necessity of creating inclusive environments. (SAHRC 2014)

#### **4.3. Funding for Higher Education**

With the escalating costs of an undergraduate education, the shift from need-based to merit-based financial aid, and the continued emphasis on legacy admittance, the university access gap between young people from low- and upper-income families has never been wider. At the most alarming of rates, bright, talented, hard-working teenagers from low- and middle-income families are being priced out of higher education opportunities. Currently about 78% of the students studying in higher education institutions are Black African students, thus funding higher education for students from lower socio-economic groups is a serious challenge. The new student funding system in South Africa had a strong impact on the universities financial sustainability. The funding crises has led the government to rethink its spending on higher education. The National Development Plan (NDP) requires the higher education sector to increase enrolment levels annually from 950 000 in 2010 to 1.6 million by 2030. Unless we find ways to reduce the costs of delivering higher education, an increased enrolment will require increased funding.

#### **4.4. Access and Success**

Poverty and the continuing social, economic and geographic disparities in the country continue to act as barriers to equitable access to higher education, and to equitable opportunity for success and social integration. (SAHRC, 2014) In recognising the historical legacy of apartheid, prevailing inequalities are closely aligned with race. There remains a negative stigma associated with poverty, and poor students continue to face challenges of access to these opportunities and face on-going social exclusion, while struggling to adapt to substantial culture shocks associated with university life. Education at all levels, including tertiary education, must be recognised as a vital component of social transformation. Education serves to challenge existing knowledge systems and social prejudices, behaviours and realities. Universities therefore play a crucial role in challenging these systems in order to transform the status quo, contributing to the development of our nation in line with a respect for and realisation of constitutional rights and freedoms for all persons. In this way, while it must be recognised that institutional autonomy and academic freedom must be jealously guarded to protect the integrity of the institutions, this must be accompanied by an appreciation of universities’ greater social responsibilities. Human rights education and the provision of spaces which allow for diverse ideas and insights to flourish, and institutions which encourage robust, critical and constructive debate are therefore key in the establishment of a society based on respect, appreciation and tolerance of diversity. (SAHRC, 2014)

## 5. Conclusion

In order for transformation to be successful in promoting equity and redressing historical imbalances, it cannot take on the form of demographic transformation alone. This form of transformation could result in the lowering of standards and may potentially amplify underlying racial tensions. Instead, such transformation measures must adequately promote the development of skills and capacity for previously disadvantaged groups.

While many of the fundamental challenges have developed under a discriminatory and oppressive history, the prevalence of these challenges also lies in the inability of the current government and institutional policies to achieve substantive reform. Over a number of years, “transformation” in the country has largely become over-simplified, with predominance given to a quota system aimed at changing demographics, while the transformation of institutional cultures has become somewhat side-lined. Although all universities have developed transformation policies and plans, the actual adequacy and implementation of these appear to be lacking, either as a result of a lack of capacity, or due to a lack of institutional will to implement reform in a meaningful way. Moreover, for transformation to move forward, staff, students and management must play an active role together and alongside university councils in the making of non-racist, non-sexist, inclusive and democratic universities.

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## LEADERSHIP FOR TEACHER PROFESSIONAL LEARNING IN SHANGHAI SCHOOLS

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### Abstract

1. Background/ Objectives and Goals: Since 2001, Shanghai has been changing the paradigm of school reform from examination-oriented education to quality-oriented education. The existing focus of the reform is to promote teacher learning and it is highly recognized that teachers are the key players to bring about successful educational transformation in terms of innovative ideas and practices. In this context, educational reforms in Shanghai are therefore fertile grounds for teacher professional learning as well as school-based research which lead to extensive educational transformation and school improvement. As an independent municipal in China, Shanghai has always been leading in education reform and Shanghai schools have been very successful in educational transformation under the national education policies.

Both principal leadership and teacher professional learning have been well-defined and systematically investigated in the past two decades. In the literature, both are widely regarded as the attributes to school success; however, there are limited empirical research studies that link them together. MacBeath (2011) proposed a research on 'leadership for teachers' professional development, and Ellie (2012) suggested there should be research that reveals principals' leadership practices in relation to teachers' professional learning. Therefore, the purpose of this study is to demystify the effects of principal leadership and teacher professional learning on the success of Shanghai schools, examine the connection of principals' leadership to teachers' professional learning, and explore actions that can be taken by principals to facilitate teacher professional learning. Teacher professional learning in this study is defined in terms of the practices of continuous professional development and team collaborative learning which focus on student achievement. This paper reports part of findings from a major study which investigates and compares school education reforms and professional learning communities in two high performing education systems in China: Shanghai and Hong Kong (2015-17).

2. Methods: Drawing on the analysis of survey data collected in 2015 from the perception of 730 teachers from 15 schools in Shanghai, this paper particularly focuses on examining the relationship between principals' leadership and teachers' professional learning, and their effects on teachers' efficacy and job satisfaction. This paper intends to address the following three research questions:

1. What are the existing practices of principals' leadership that leads to teacher professional learning in Shanghai schools?
2. What is the relationship between principals' leadership and teachers' professional learning in terms of continuous professional development and team collaborative learning?
3. What is the relationship between teacher professional learning and teacher efficacy and job satisfaction?

3. Expected Results/ Conclusion/ Contribution: The findings reveal that principals' leadership has positive and significant effects on teachers' continuous professional development and team collaborative learning, which in turn, has positive effects on teacher efficacy and job satisfaction. It is evident from our study that Shanghai schools have well developed systems and policies on teacher professional development and a strong culture of collaborative learning. Both principal leadership and teacher professional learning have critical contributions in supporting the schools' success. Their contributions to the education reform in Shanghai and school success in the PISA 2009 and PISA 2012 are indispensable. It is to argue that educational reforms are more likely to succeed when teachers are involved, when teachers work collaboratively, and when principal leadership supports teacher professional learning. In order to sustain consistent school improvement, not only should school leadership focus on principals alone, but also should teachers learn continuously, collaboratively and professionally. This study sheds light on how principals can play a key role in leading teachers to learn, develop, grow and transform and how to develop professional learning community in Shanghai schools.

**Keywords:** *School leadership, teacher professional learning, education reform, Shanghai, China.*

### *Acknowledgement*

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## EXPLORING PROFESSIONAL LEARNING PRACTICE IN SOUTH AFRICAN SCHOOL LEADERSHIP PROGRAMMES BETWEEN 2008-2013

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### Abstract

This study explored the professional learning practice with the aim to evaluate how the phenomenon is integrated within school leadership curriculum; to establish its impact in real practice; and to propose conceptual framework that can guide future practices. Local and international literature on professional learning practice in school leadership was reviewed. It was augmented by the empirical study that involved interviewing and document studies of the three Limpopo schools were conducted. Discourse analysis and narratives were used to analyse data. The study revealed non-integration of professional learning practices within school leadership programmes, and that the integration was left as a prerogative of universities facilitators. As a result, the impact was non-existence except in cases where a student principal takes an initiative to put the immediate and the distant colleagues on board. This study concludes that professional learning practice that is expected to provide theoretical underpinnings of this programme was omitted in the design and implementation of the programme.

*Keywords:* School leadership, school leadership programmes, professional learning communities, professional learning practice, curriculum.

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## 1. Introduction

### 1.1. Background to the study

Professional learning practices (PLP) are encouraged in workplaces that are serious about organisational and employee development. PLP provides environment where organisational heads and employees share their workplace challenges, opportunities and good practices. Since schools are regarded as learning organisations and knowledge systems (Thaba-Nkadimene 2017: 41), school principals are expected to be life-long learners to bring about expected social transformation. The research reveals that school principals find their jobs burdensome or rather cumbersome because of enlarged scope of their duties and responsibilities (Bush and Glover 2016) due to the adoption of School-Based Management approaches by education ministries across the globe. This study is part of a doctoral study that focussed on lessons learnt in the implementation of School Leadership and Management development programmes by universities in Limpopo. Building professional learning communities that promote PLC is possible in an organisation that has taken initiative on developing schools into learning organisations (Thaba-Nkadimene 2017). This evaluation study reports on how professional learning practice was promoted during the implementation of the Advanced Certificate in Education-School Leadership and Management (ACE-SLM) programme by two universities in Limpopo Province, South Africa. Universities under study started with the roll-out of ACE-SLM programme in January 2008 and ceased in June 2013. This is the report from the evaluation study that considered the implementation of the ACE-SLM programme in the period 2008 and 2013.

### 1.2. Purpose of the study

The main purpose of this study was to examine if professional learning practice (PLP) was promoted during the implementation of the ACE-SLM programme by two universities in Limpopo Province. The objectives that supported the purpose of the study were as follows:

- To ascertain if the implementation of ACE-SLM programmes was framed within PLC philosophy.
- To examine if the implementation of the ACE-SLM programmes promoted sustainable PLP.

- To investigate whether the ACE-SLM programmes facilitated the establishment of professional learning communities (PLP).

In order to achieve the purpose and the objectives of the study, the study attempted to provide the answer to the research main question, namely, “how did the implementation of ACE-SML programmes by universities in Limpopo promote PLP?”

## 2. Research Methodology

### 2.1. Research approach and designs

A mixed method research was adopted in this study. The evaluative nature of this study required more than one methodological tradition and more than one way of knowing (Johnson, Onwuegbuzie and Turner (2007: 19). A case study and survey were used as research designs. This is in line with Yin (2008) when he contends that a research design is the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately, to its conclusions. The qualitative case study was used to achieve holistic and meaningful characteristics of real-life events taking place in schools and amongst student principals (Yin 2008: 4). On the other hand a survey strategy facilitated the gathering of quantitative data from a relatively large sample (De Leeuw, Hox and Dillman 2008: 2).

#### 3.2 Population and sampling

The population consisted of 700 school principals who were trained in the period 2008-2013. Two hundred and fifty (250) of school principals were random sampled to participate in survey questionnaires whereas 30 of them were purposively sampled to participate in the interviews.

### 2.2. Research Methods

The unstructured questionnaires were conducted to 30 school principals. Self-administered questionnaires were distributed to 250 school principals through internet and self-delivery for completion. The choice of the two data collection methods was informed by the use of the mixed method research approach Greene (2008) and the evaluative and the pragmatic nature of this study. Data derived from questionnaires were analysed using frequency tables whereas data derived from interviews were analysed using content analysis and narratives.

### 2.3. Triangulation

Triangulation was used in this study as a strategy to improve trustworthiness and credibility of the research methods and findings (Golafshani 2003: 603). The method triangulation was achieved in this study when questionnaires and interviews were used as data collection methods (Carter 2014: 545). Furthermore, respondent triangulation was achieved when 250 and 30 respondents were used in the study (Torrance 2012: 114).

## 3. Findings of the Study

### 3.1. Findings from qualitative study

There was a mixed response on the question on whether the implementation of ACE-SLM programmes promoted sustainable PLP. Like the majority of the respondents, 86.67%, Respondent 16 agreed that the implementation of ACE-SLM programme promoted sustainable PLP. He highlighted that: *“the implementation of ACE-SLM programme’s encouraged learning communities through which school principals learn from each other, during and beyond cluster meeting”*. Contrarily, Student 19 disagreed that: *“the professional learning practice was encouraged during the ACE-SLM programme, but not beyond programme years. During the programme student principals interacted closely on matters affecting their schools, but this was not sustained. After graduation, students practically went their separate ways”*. In general, 86.67% of respondents agreed that ACE-SLM programmes promoted sustainable PLP.

On the aspects of whether PLP encouraged the sharing of the school challenges and the seeking of solutions; on whether crucial school and leadership and management information was shared; and whether the best practices amongst students and colleagues were shared the majority of respondents, 26 of 30 (86.67%) believed that they were able to share information and experiences with others. Respondent 5 highlights that: *“The information received from the ACE-SLM programme was shared amongst the school management team, teachers and school governing bodies. Other schools did benefit, because I was able to circulate crucial information amongst schools in my vicinity”*. This was supported by Respondent 21 who indicated that: *“school principals who participated in ACE-SLM programmes were able to share materials and their new experiences with different school stakeholders”*. This finding

is in line with Wenger (1998:1) finding that institutions such as schools develop professional learning practices around things that matter to their practice and society.

On the aspect of whether the ACE-SLM programmes facilitated the establishment of professional learning practices (PLP), 100% of the respondents agreed. In support, Respondent 20 contends that: *“the fact that adult persons like school managers participated in this programme; it awakened the community of practice and brought into perspective that learning is a life-long process”*. The programme is in line with Mindich and Lieberman (2012: ii) finding that many schools promote effective professional learning through PLCs which are made up of groups of school leaders and teachers who collaborate to improve their practice to meet learner needs. In the context of the ACE-SLM programme the professional learning practice approach helps school principals in sharing experiences of best practices and seeking solutions to school challenges.

### 3.2 Findings from quantitative study

Table 1. Building professional learning practices in the ACE-SLM programme.

| Statement  | Level of agreement |           |
|--|--------------------|-----------|
|  | Agree              | Disagree  |
| The ACE-SLM programmes' implementation was framed within PLC philosophy.                       | 96% (240)          | 4%(10)    |
| The ACE-SLM programmes' implementation promoted sustainable PLP.                               | 88% (220)          | 12%(30)   |
| PLP encouraged sharing the school challenges and seeking solutions.                            | 91.2%(228)         | 8.8% (22) |
| PLP promotes sharing of crucial school and leadership and management information.              | 82%(205)           | 18%(45)   |
| PLP encouraged sharing of best practices amongst students and colleagues.                      | 88% (220)          | 12%(30)   |
| The ACE-SLM programmes facilitated the establishment of professional learning practices (PLP). | 86%(215)           | 14%(35)   |

*Amended from Thaba-Nkadimene KL (2017): Doctoral Thesis: University of Limpopo, South Africa*

Table 1 displays data from questionnaires on building professional learning practices (PLP) and it indicated significant levels of agreement of THE six questions rose. Data reveals that 96% of student principals believed that the programme was framed within PLC philosophy, whereas, 88% stated that the ACE-SLM programmes' implementation promoted sustainable PLC. On the aspect of PLP sharing the school challenges and seeking solutions; crucial school and leadership and management information; and best practices amongst students and colleagues 91.2%, 82% and 88% were respectively achieved. On the question on whether the ACE-SLM programmes facilitated the establishment of professional learning practices (PLP), 86% was achieved. The analysis of qualitative data indicated that the implementation of ACE-SLM programme promoted sustainable PLP. This indicates that the design and the implementation structure of the ACE-SLM programmes were premised within professional learning communities.

### 3.3. Synthesising quantitative and qualitative findings

This section provides the synthesis of the quantitative and the qualitative findings. Mixed method research requires synthesising of quantitative and qualitative findings (Teddlie and Tashakkori 2009). The quantitative and qualitative findings on whether the implementation of ACE-SLM programmes promoted sustainable achieved significant level of agreement at 88% and 100% respectively. The general picture is that the implementation of the ACE-SLM programmes promoted sustainable PLP.

The three quantitative findings on whether the PLP was encouraged in the implementation of ACE-SLM programmes for sharing of the school challenges and the seeking of solutions; on whether crucial school and leadership and management information was shared; and whether the best practices amongst students and colleagues were supporting the same qualitative findings that attained significant levels of more than 80%. This indicates that the implementation of ACE-SLM programmes promoted PLP that amongst others encouraged the sharing of the best practices. The quantitative findings on whether the ACE-SLM programmes facilitated the establishment of professional learning practices (PLP), achieved 86, 67% whereas the same findings from qualitative data revealed 100% level of agreement.

#### 4. Conclusion and Recommendations

This study concludes that ACE-SLM programme encouraged sustainable professional learning practice approach. However, there were areas that needed improvement in the implementation of ACE-SLM programmes by the universities in Limpopo. This study recommends that PLP should be integrated within the ACE-SLM programmes' curriculum, and be extended in the mentoring programmes. The study recommends large scale research to establish the possibilities of extending professional learning communities beyond the university years.

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## METHODS USED FOR DETERMINING OF ECONOMICAL EFFICIENCY OF SELECTED ACTIVITIES FOR HIGH SCHOOL STUDENTS

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### Abstract

We briefly introduce the activities (correspondence competitions and camps) that are used by some faculties to motivate high school and gymnasia students (ISCED 3) for further study of fields taught by them, preferably at the faculty which organizes such activity. Participation in many of those activities is free of charge for upper (or lower) secondary school students. Those costs are paid by faculties (or organizations which organize them) and those cost can be high. It is hard to decide which activity should be funded more, which less and which should be terminated. Therefore, we introduced a system which helps to determine it on our faculty. This article describes the metrics used and reasons for their usage.

**Keywords:** *Informal education, efficiency, science competitions, correspondence competitions.*

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### 1. Introduction – Correspondence Competitions and Camps

The following paper is about adoption of some metrics enabling us to somehow measure the financial efficiency of correspondence competitions and camps organized by the Faculty of Mathematics and Physics of Charles University (hereinafter Faculty). But we need to, at least briefly, introduce the activities to know what was measured.

Correspondence competitions are very old idea. Their origins are at 19<sup>th</sup> century and the eldest known such competition to the author is KöMaL (<https://www.komal.hu/info/bemutakozas.e.shtml>) which started in 1894. Many of those competitions started, and some also ended, in the Czech Republic and Slovakia – more complete list can be found on Czech Wikipedia (Korespondenční semináře). From those beginnings, the time has changed quite a lot and they accept solutions by e-mail, although most of those activities offer still possibility to send solutions by post.

Workflow of correspondence seminar is like that: Organizers (most often university students – ISCED 6, 7 & 8) send/make public problem assignments. Participants have some time (~ month) to solve it and send it back. Usually they can send only some solutions and those solutions can be only partial. Organizers correct those solutions and assign points for them. The corrected solutions are sent back to the participants so they have feedback. Usually there is also made public list of participants and their points. The best participants are invited for some face-to-face activities – most usual is to have two camps for participants each school year. More about them can be found in Czech in Master's theses of Hájková (2008) or Kolář (2014).

Camps can be standalone or as a reward for participation in the correspondence competition. The Faculty organizes both types. They differ in many small details among them but there is a common logic that the camps for reward are cheaper (sometimes even for free) for participants in contradiction to the standalone camps. Those are more expensive, but Faculty also partly donates them.

Here follows the list of correspondence competitions (hereinafter CC) and camps (hereinafter Ca) whose data were processed. The names are Czech abbreviations.

- FYKOS – CC – physics, for upper secondary students – <http://fykos.org><sup>1</sup>
- MKS – CC – mathematics, for upper secondary students – <http://mks.mff.cuni.cz>
- KSP – CC – informatics, for upper secondary students – <http://ksp.mff.cuni.cz>
- M&M – CC – math, physics and inform., for upper second. students – <http://mam.mff.cuni.cz>
- Pikomat – CC – mathematics, for lower secondary students – <http://pikomat.mff.cuni.cz>

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<sup>1</sup>This CC is probably the only one which has also web pages in English.

- LŠMF, ZŠMF, LMFS and SMFM are four Ca, focused on all math, physics and informatics and for upper secondary students

## 2. Motivation

The motivation for these statistics for Faculty was to determine whether the funds used for organization of such activities have some measurable effect on choices of high school students in voting their future studies. The Faculty is especially interested if they after high school continued with their studies at our faculty and not at some other university.

Activities mentioned above have long history (camps more than 12 years, correspondence seminars at least 18 years) and they have data about their participants so it is possible to try to do it.

## 3. Design

For any measurements, we must have variables and data. Let's start with our approach to this matter, also a bit in historical sequence and how the model was improved.

### 3.1. Absolute numbers

The first characteristic measured and simplest is to count the number of participants of some activity each year. We call it **all**. This number shows something about activity of this CC/Ca, but it does not go to the core problem – to know whether the students starts to study at the Faculty.

The first improvement is to measure the number of participants who have already started to study and previously (at some school year) participated in some competition. We are starting to meet the problems. Only the students who finished their high school studies can continue at university. Most of the participants of CC or Ca are in the second or third grade of four yearlong high school. We should wait usually at least two or three years to have quality quantitative data. We call this variable **factul**.

We can add to the previous statistic also the number of people who we know that finished high school and haven't started to study at faculty (**out**) and the number of still high school attendants (**high**). Then we can see more clearly, what is the number of "quitters" or we are just waiting for them.

Then we are interested in the number of absolvents (**abs**) – the number of participants who started with study and finished it already gaining the Bachelor degree. For this we must wait at least three more year to have reliable data. Standard length of study is three years but it can be prolonged and it is quite common to study four years in the Czech Republic. We can also compare the average share of successful absolvents each of those who participated in these activities and started study at the Faculty with average share of absolvents who haven't participated in anything.

But when we are interested in acquirement of new participants, we also want to know the number of new participants. We call this statistics **entry**.

### 3.2. Weighted statistics

Until now we used only absolute numbers of participants, but we come to one problem. When we organize more activities, there is possibility that one participant attends to more such activities.

Since we are not able to easily distinguish what was the first activity if there were more activities in the first year, we have two main options

A. Divide one point to every activity evenly for every participant. Hence if someone participates in 2 years of one activity and then for 1 year in two other activities, the two-year activity obtains 0,5 and the two others get 0,25.

B. Divide one point among activities the participant was part of only in the first year of his history in our database. If someone participates the first year in one activity and the second year in 5 activities, the full one point goes to his/hers first activity.

When we use A to count it among all years of participation, we call this statistics **unif**.

We decided also to applicate A only to the absolvents – that created new statistics called **aunif**.

The last one statistics we counted using weighted numbers is **eunif** using B on entry.

### 3.3. Correlations and "Out-In" graphs

When we started to ask the question about gaining as much as possible unique participants, we should surely look at correlation of participation in competitions. If there is high number/correlation of some activity with every other, there is a sign that this activity is not as much fruitful, as we wanted it to be.

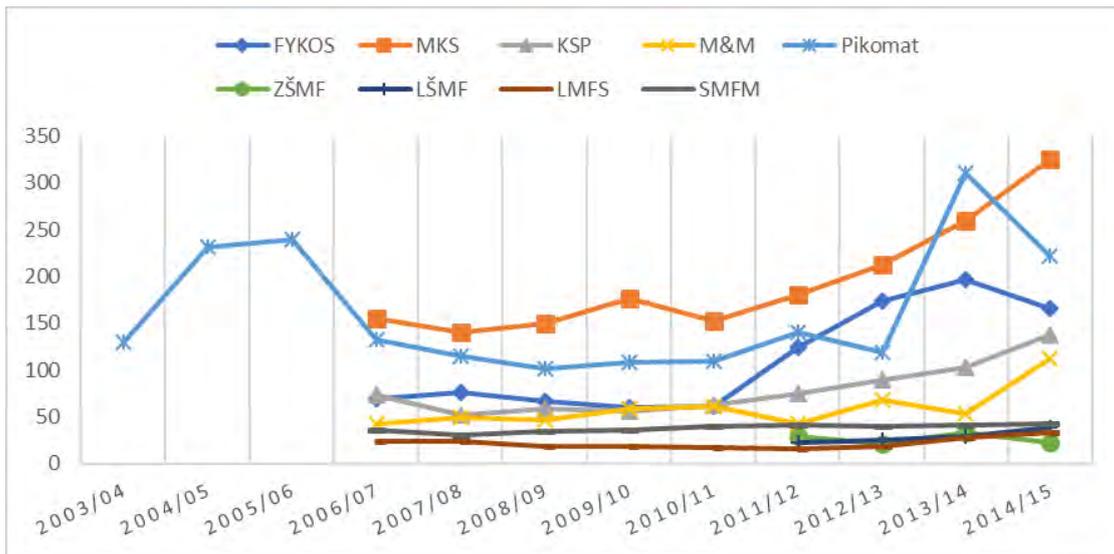
Also, we can see from which competition or camp participants go after their first year – so we can see their “migration” and we can name it “Out-In” graph.

#### 4. Results

We introduce only some example results due to the limited space. Also, we should not disclose the budgets of the concrete activities. Hence, we show here only some statistics which does not show concrete financial numbers. Actually to determine the financial efficiency connected to one of the previously described statistics, is sufficient to divide budget of a activity by demanded statistic (all, facult, out, high, abs, unif, aunif or eunif).

In the figure 1 you can see the total numbers of participants of evaluated correspondence competitions and camps.

Figure 1. Statistics of all participants of CC's and Ca's.



In the figure 2 we can see the numbers of unif for the correspondence competitions.

Figure 2. Statistics of unif participants of CC's.

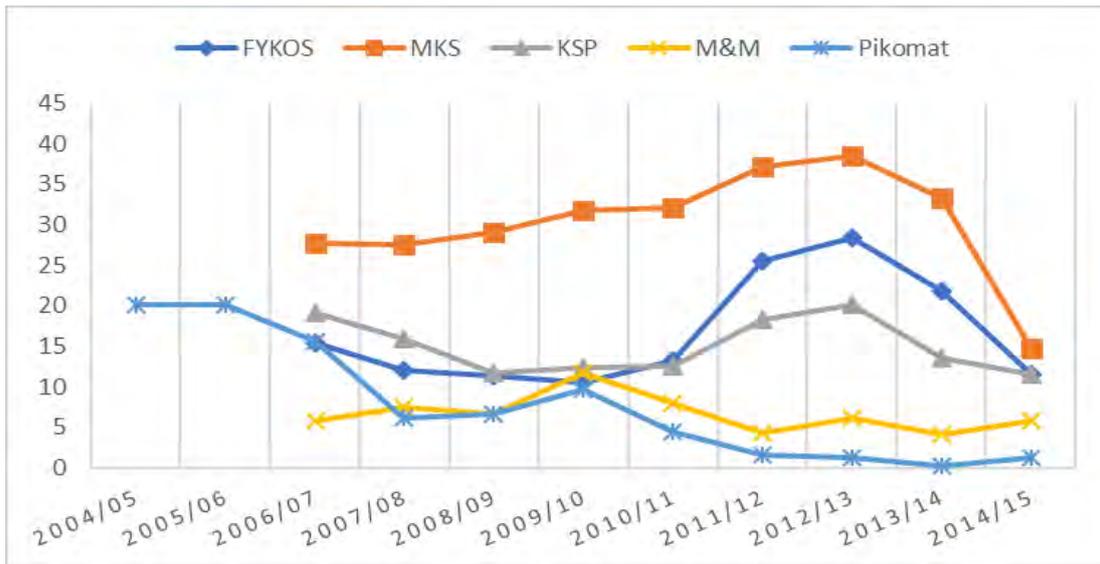


Figure 3. Statistics of aunif participants of CC's.

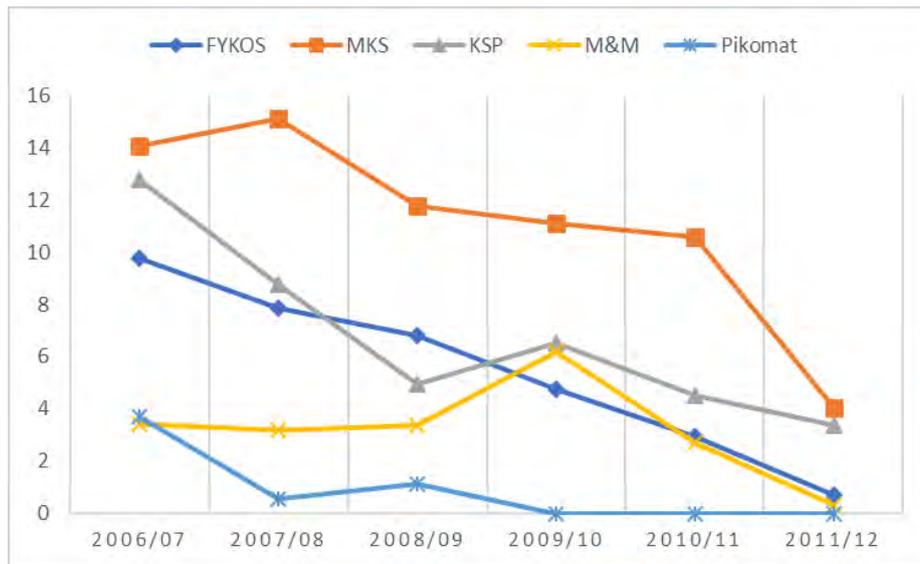


Figure 4. Statistics of eunif participants of CC's.

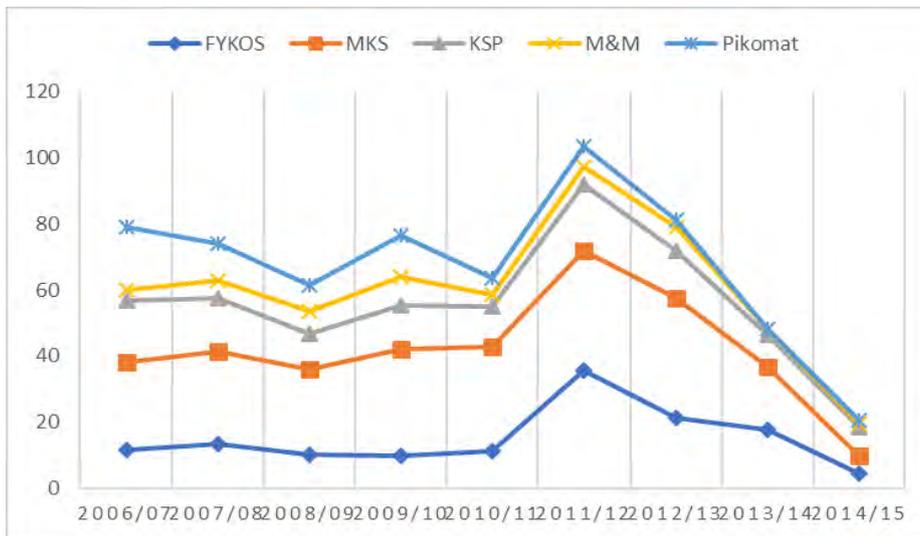
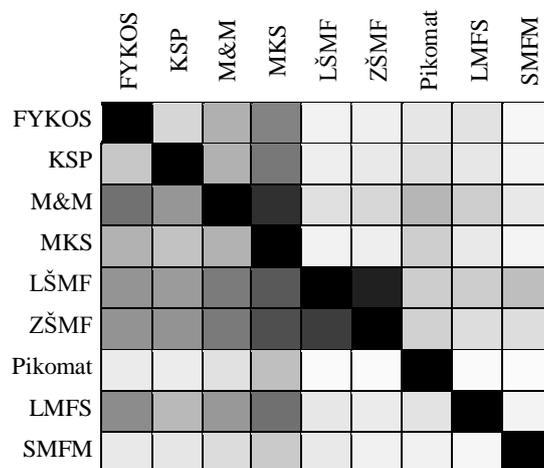


Figure 5. Covariations of participations in activities – the probability of participation in activity in the column if someone participates in the activity in the row – the higher prob. the darker cell.



## 5. Discussion of possible improvements

The first big problem of any such statistics is to have consistency in data. This is quite tricky. The problems are in connecting data into one database, because different organizers store different data and in different formats. At Faculty was introduced one format for the central database of these activities where they should send regularly data. They use their own databases but then send the data in this format. This is not win, because there are many inconsistencies or missing data in databases about the long-gone-by years of competitions or camps. The new data are not flawless too. There can be a small mismatch in some data and algorithms used to determine whether the two entries are the same person do not recognize it. Or when we have these algorithms too benevolent, we can accidentally merge some people who are two individuals. Therefore, the data must be maintained also manually and someone should check thousands of small (possible) mistakes.

There is also problem in connecting of data of participants with the data of faculty's students.

There are more activities, but some of them cannot be evaluated. For example, the CC in physics for lower secondary schools is active only for 6 years, so just the first two years of this competition could be evaluated but not fully. So only the first two years could be evaluated, but not all the participants are at the universities now.

There could be possible law problems with storage of personal data of participants – so if you want to do it by yourselves on your competition, consult lawyers.

Such statistics should be done and closely watched every year to make it significant for those activities and there should be also added some motivational element for organizers. For example, there can be some automatic effect on their budget according to the results. Sincerely, nothing systematic was introduced at Faculty yet.

### *Acknowledgments*

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# POSTERS





# PROFESSIONAL IDENTITY SURVEY ON UNDERGRADUATES OF PREVENTIVE MEDICINE AND HEALTH LAB SCIENCE IN SICHUAN UNIVERSITY

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## Abstract

Professional identity, is affected by various factors such as individual, school and society, and it affects learning attitude, academic performance, and even future career. There are quite a few studies on profession identity of different majors, however, rarely related to preventive medicine and health lab science. The aim of the current study is to examine the status quo of professional identity among undergraduates majoring in preventive medicine and health lab science, so as to identify way to enhance their learning interest and ability. For this purpose, we designed a questionnaire based on related literature review. Methods of descriptive statistical analysis, independent sample T-test and one-way ANOVA were adopted in the research.

**Keyword:** Professional identity, undergraduates, preventive medicine and health lab science.

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## 1. Introduction

Professional identity (PI), in this research, can be defined as how much college students identify with their majors, which consists of four dimensions of cognition, emotion, expectation and behavior. Cognition means to what extent the students know about their major. Emotion refers to the attitude of students to their major study and how much they like their major. Expectation refers to the benefits the students wants to gain by major study, consisting of substance and spirit. Behavior means the actual actions the students take to achieve their major study.

### 1.1. Research tool

A questionnaire of two parts was designed to measure the PI of undergraduates. The first part collected basic information of the participants, and the second used the Likert scale made up of 28 items or 4 dimensions, to measure the PI of undergraduates. Pilot study had been carried out before the formal investigation to confirm the reliability and validity of the questionnaire. The Alpha coefficient of Cronbach was 0.894, and the coefficient of content validity was 0.8607, which means that the designed questionnaire was eligible to investigate the professional identity of undergraduates.

### 1.2. Participants

All the participants were undergraduates of prevention medicine and health lab science in Sichuan University. Of 599 questionnaires that were given out and collected, 515 were valid, among which 398 were female, 117 male; 353 studied preventive medicine and 162 health lab science.

## 2. Results

The mean of PI and four dimensions was all above the median of 3.0. This indicated that PI of undergraduates of preventive medicine and health lab science of Sichuan University was above the median level, with expectation > behavior > cognition > emotion.

## 2.1. Demographic features

Demographic features covered *gender, urban or rural dwellers, only child in the family*. Based on the descriptive analysis and T-test, *gender* had an effective impact on PI and behavior, *urban or rural dwellers* on emotion, and *only child in the family* on cognition and behavior.

## 2.2. General outcomes

General outcomes included several factors, such as *accepted by their first choice, student loan and student cadres*. Among those *accepted by their first choice and student loan* had significances on cognition, and *student cadres* had no evident effective impact on PI or four dimensions.

The findings also showed that majors had no significant effect on PI or four dimensions. We therefore compared each grade of two majors separately. For undergraduates majoring in preventive medicine, *grade* had a significant effect on PI and four dimensions; and for undergraduates majoring in health lab science, *grade* had a significant effect on PI and cognition, emotion and expectation.

Table 1. Differences in PI and four dimensions among the grades.

| Major               | Variable    | F     | P    | LSD   |
|---------------------|-------------|-------|------|---|
| Preventive medicine | PI          | 3.939 | .004 | grade 1 < grade 2, grade 2 > grade 4, grade 2 > grade 5                                       |
|                     | cognition   | 5.293 | .000 | grade 1 < grade 2, grade 1 < grade 3, grade 1 < grade 5, grade 3 < grade 5, grade 4 < grade 5 |
|                     | emotion     | 6.624 | .000 | grade 1 < grade 2, grade 2 > grade 4, grade 2 > grade 5                                       |
|                     | expectation | 3.154 | .014 | grade 1 < grade 2, grade 2 > grade 4, grade 2 > grade 5                                       |
|                     | behavior    | 2.824 | .025 | grade 1 > grade 4, grade 2 > grade 4, grade 3 > grade 4                                       |
| Health lab science  | PI          | 3.638 | .014 | grade 1 < grade 2, grade 1 < grade 3  |
|                     | cognition   | 4.775 | .003 | grade 1 < grade 3   |
|                     | emotion     | 2.936 | .035 | grade 1 < grade 2   |
|                     | expectation | 4.196 | .007 | grade 1 < grade 2   |
|                     | behavior    | 2.044 | .110 |   |

## 2.3. Outcomes related to major

Analysis results of one-way ANOVA and multiple comparisons indicted that *major choice* had a significant impact on PI, emotion and expectation, *employment prospect* on PI, emotion, expectation and behavior, and *learning condition* on emotion.

Table 2. Differences in PI and four dimensions related to major.

|                     | Variable    | F      | P    | LSD  |
|---------------------|-------------|--------|------|--|
| Major choice        | PI          | 6.926  | .001 | by themselves > major transfer                                   |
|                     | cognition   | .870   | .420 |  |
|                     | emotion     | 14.170 | .000 | by themselves > by their parents, by themselves > major transfer |
|                     | expectation | 4.056  | .018 | by themselves > major transfer                                   |
|                     | behavior    | 1.842  | .159 |  |
| Employment prospect | PI          | 10.122 | .000 | most popular > popular > less popular                            |
|                     | cognition   | 1.241  | .294 |  |
|                     | emotion     | 17.037 | .000 | most popular > popular > less popular                            |
|                     | expectation | 8.209  | .000 | most popular > popular > less popular                            |
|                     | behavior    | 4.436  | .004 | most popular > popular > less popular                            |
| Learning condition  | PI          | 2.500  | .083 |  |
|                     | cognition   | .674   | .510 |  |
|                     | emotion     | 5.835  | .003 | very good > good, very good > bad                                |
|                     | expectation | 1.280  | .279 |  |
|                     | behavior    | 2.088  | .125 |  |

## 3. Discussion and Conclusions

### 3.1. Discussion and conclusion on demographic features

Our findings show that female undergraduates scored higher in PI and behavior than males, which is in line with the research outcome of Yan Ma and Jay Zhang etc. on undergraduates' PI of Sinkiang. The female, presumably, matured earlier than the male, resulting in their higher score in behavior on major study.

Undergraduates living in the rural area had a lower emotion score than those living in the urban area. It is probably attributed to the gap between rural and urban areas in living condition, family finance and education resources in China. The only one child in family scored higher in cognition and behavior than those having siblings. This may be explained partially by the fact that the only one child in the family does not have to share education resources with siblings.

### 3.2. Discussion and conclusion on general outcomes

The undergraduates enrolled in the major as their first choice scored higher in cognition than otherwise. Those who chose the major as their first choice presumably knew better about their major than those who did not.

The undergraduates who have applied for student loan scored lower in cognition than otherwise. The students apply for loans because they cannot afford the study tuitions. It is therefore likely that they had to be busy with making money during their spare time instead of learning more about professional information.

### 3.3. The effects of professional factors

The students who made the major choice made by themselves had a higher PI, emotion and expectation than those by their parents or major transfer. Here interest could explain the results, because those choosing a major by their own should supposedly have a special affection for this major.

The students who consider their major popular had a higher PI, emotion, expectation and behavior. The thought of better employment prospect made students optimistic toward their specialty and future, thus inclined to score high. Students holding a positive opinion on learning condition had a higher emotion score. These students were probably satisfied with their learning condition, which, in turn, made them score higher in the emotion dimension.

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## ELT STUDENTS' MOTIVES FOR NON-PARTICIPATION IN CONTEXTUAL GRAMMAR I COURSE

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### Abstract

Communication and interaction are the most essential elements in foreign language (FL) teacher education mainly because teacher candidates are required both to develop their target language and to learn how to help their future students to learn the FL. Both involve the straight use of the language itself in a communicative and interactive way. Nevertheless, FL teacher candidates are observed to be in one-way communication in their field courses, passively accepting the information delivered. In this questionnaire study, as part of a larger survey, the aim is to find out first-year English Language Teaching (ELT) students' perceptions regarding their participation during Contextual Grammar I (CG-I) courses at the Faculty of Education. The questionnaire is composed of sections for demographic information, participant's self-reports of the frequency, type and timing of participation during the whole term as well as 40 statements which reveal distinct reasons for the participant's non-participation behaviour both in CG-I course and in other four English-language skills courses. The statements are compiled from the written notes of a group of 40 representative students prior to the present data collection. Findings related to CG-I course as expressed in the written notes showed that the students felt anxiety about their friends' presence and likely inner talks about linguistic inadequacies although they selected items about having trouble with grammar and speaking as the main reasons of non-participation in the questionnaire. The present paper reports a part of a larger on-going survey concerning student behaviour in all ELT courses in general. The results can represent a first-rate starting point to address the most relevant learning problems when instructors design their FL courses.

**Keywords:** *Foreign language education, participation, grammar.*

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### 1. Introduction

Communication and interaction are the most essential elements in FL teacher education but FL teacher candidates are commonly observed to be in one-way communication in their field courses, passively accepting the information delivered, which may be a strategy of failure-avoiding behaviour (McInerney and McInerney 2002: 218). This study aims to find out first-year ELT students' perceptions regarding their participation in the CG-I course. *Participation* has always attracted attention from the practitioners especially who are teachers of large heterogeneous classes. Learners who let their voices heard have usually been confident ones whereas silent parties seem to be hesitant about the accuracy of their knowledge. However, classroom education settings need to include each and every student in communicative activities to increase "negotiation of meaning" (*Interaction Hypothesis*, e.g. Long 1996) as well as opportunities for language practice and hypothesis-testing by learners of different characteristics. Participation in a task actively may help the learner notice a lack of linguistic knowledge by way of getting feedback, for instance in the form of explicit teacher or peer correction. Hence, we need different tasks that may bring up different motives for participation. This on-going study is meaningful for education since the results can unveil the ELT students' prevailing motives for not participating in the course, which can represent a first-rate starting point to address the most relevant learning problems when instructors design their FL courses.

### 2. Methodology

This descriptive study uses the term "participation" as referring to the learner's actively responding either to teacher or peer inquiries (such as answering, in spoken form, an oral or written question regarding personal experiences or grammatical structure), or asking questions (requiring information or clarification). As the instrument of the study, a *questionnaire* form was devised; it included sections for demographic information, self-reports of the frequency, type and timing of

participation as well as 40 statements which reveal distinct reasons for the participant's non-participation both in CG-I course and in other four English-language skills courses. A space is provided to add other opinions if they have any. The statements were polled from the written responses of a group of 40 representative students to the question "why would a student opt out for participation in oral class activities and communication processes?" The 30 reasons surfaced were added to the 10 items initially formed by the researcher from her classroom practices. Comprehensibility of the whole instrument was checked and negotiated by two representative students prior to data collection. Statistical analyses showed that the items were generally reliable (Cronbach's Alpha .822 for the total). All the data were collected at the end of the learners' first semester in the Department in the fall term of 2016-2017 academic year.

*The participants* are 105 first-year ELT students, most of whom are female (72%) and who are graduates from roughly ten types of high schools in different places within Turkey and abroad; about half (49,5%) are from Anatolian High Schools, where English language-mediated courses dominate the syllabus. The highest population (23,8%) graduated from a school in the university city. They were all from the six class sections of the course delivered by the researcher. They received CG-I Course once a week for three class hours.

As for the *context* of instruction, the CG-I course aims to have students grasp the way advanced grammar principles function in given contexts and apply them so that they can achieve correct, coherent and sophisticated sentence formation with versatility and effective control on punctuation. Course activities and tasks comprise whole class oral question-answers for reading comprehension on the course book text (Maurer, 2006), grammatical form discussions with written questions and sample text tables, study of forms and functions accompanied by oral and written learner productions regarding learners' personal life and immediate surroundings. Course book exercises are answered together with negotiations of meaning and the instructor provides personal feedback in terms of appropriate forms and meanings for the learners' written productions concerning their daily life and interests. Visuals are employed to support the contextualization of language forms and functions.

*Data analyses* included working out frequencies, percentages and statistical analyses for significance of the data. The students' notes were also examined to elicit clarification for the results.

### 3. Results and discussion

As plausible evidence for real participation rates, self-reports of frequencies were as follows: 41% of the students stated that they mostly or always participated while 35.2% reported that they either rarely or never took part in the class activities, and 23.8% of the population reported occasional participation. Analyses indicated that there is negative significant correlation between the participation rate and total scores from the items which reveals the reason why they do not participate ( $r=0.383$ ,  $p<0.01$ ). Considering the direction of the scores, the less they participate in the lesson (low scores), the more reasons they have (high scores).

Related to the way the students participated, when they did, 76.2% of students informed that they answered written or oral questions orally. Next high rates comprised asking a question and providing a related example (42.9% for each). Other predicted ways of participation (such as requesting more information) were preferred by 26.7% or less. No other ways were suggested by the students. As for the phase of the lesson when they participated, they mostly selected the time for exercises (63.8%). Besides, more than half (52.4%) claimed participation during studying the charts and notes in the course book.

Regarding the grounds on which the students decided to opt out and to join in occasionally the lesson tasks and communications, the collected data, not surprisingly, indicated that there are only two statements on which more than half of the population agreed; they refer to the fear of making grammar mistakes (56.2%) and to the difficulty in speaking (50.5%), with the highest means (2.33 and 2.24 respectively, out of 3, i.e. "Agree"). Nevertheless, in the written notes collected prior to the study the students expressed uneasiness in the class with many others nearby:

(1) "*Speaking in English instantaneously makes me feel very tense, particularly before the crowd, and this is why I have those moments when I turn away from participating in the lesson.*"<sup>1</sup>

(2) "*Sometimes I cannot talk even I know the answer of the question; I keep quiet for the fear that they may realize the smallest mistake I made and say to themselves 's/he could not do even that' for my mistake. At other times I consider that I cannot speak in English adequately well. I know my teacher will understand me but I again keep quiet for the fear that my friends notice it and say 'even though s/he finished a FL-branch class at high school, s/he cannot talk'.*"

These student statements voiced many other students' arguments in their initial notes and on the data form. The motto adaptation "nothing ventured, nothing failed" seems to fit flawlessly into the present situation (McInerney and McInerney 2002:218). As a psychological principle underlined by McInerney and McInerney (*ibid.*:225), strong negative feelings may damage motivation, and cause low performance.

<sup>1</sup>Student texts number 1, 2 and 4 are translated from Turkish to English by the researcher.

In the additional notes on the data form, eight students brought up such problems as being psychologically tired, sad, and depressed, and missing their family. Nonetheless, it was clearly shown by the data that the students' non-participation behavior was *not* a result of such states as boredom for learning English (88.6% disagree), a dislike for the teacher or the lesson (85.7% and 70.5% respectively disagree), inattention to the lesson (83.8% disagree), an inability to understand the context of communication (69.5% disagree), or a felt redundancy or insignificance for own participation (68.6% disagree). This statement may represent this stance and the previously stated concern with speaking:

(3) *"Grammar is very important and interesting lessons. But I can't speak English fluently so I don't speak in this lesson."*

On the other hand, more than a third of the students are unsure about whether they will speak or remain silent when they lack the knowledge questioned in the task. In most cases of "Neither agree nor disagree", the respondents personally stated during data collection that they mean "sometimes". Further interviews will most probably reveal the motives behind this kind of results. There were still more students who disagreed with these reasons than those who agreed, which indicates that they mostly knew what to say.

(4) *"Students may not have trust in themselves. In a case of incorrect pronunciation they may have inferiority complex. They may have got used to follow the data the system provided. You know that participation and negotiation do not have a place in our Turkish Education system."*

Theory about the learning environments also argues that the learner may not have communicated well in the class due to previous learning experiences with traditional methods even though they studied hard to master rules and structures (Dulay, Burt and Krashen 1982:20). Besides these highly noticeable rates, frequencies for a number of items have had outstanding behavior in the data; they presented almost even distribution between agreement and disagreement ends. Highly polarized items (above .897 standard deviation) included such personal or preference matters as feeling inconfident, shy, not being a talkative type of person, and wishing others to respond, and course-related issues such as fear for making vocabulary mistakes, and a dislike for interactive work.

#### 4. Conclusion

The aim of the study was to find out first-year ELT students' perceptions regarding their participation during Contextual Grammar I (CG-I) course at the Faculty of Education. A remarkable finding was that the students seem to be in need of psychological support to overcome their fears like making grammar or pronunciation mistakes, as highlighted by a student in their additional note:

(5) *"About 2.3.4.5.6. questions in universities we need to a lesson like psychology or guidance"*

A viable solution may be to spare around five minutes of every class day to hearten quiet students for active involvement. Even in crowded classes, a structured (i.e. carefully planned and possibly later documented) interactive discussion about a different aspect of lesson participation (oral, written, peer feedback, dialogue, planned and prepared speech about self) might help students express themselves and find solutions for their difficulties. Rehearsed speech, for instance telling the class mates about an interesting event using the form/function covered, at different phases of the lesson may especially be helpful for them to taste the feeling of being listened to, being heard and being appreciated by others as well as diminishing anxiety and defeating mockery. They may also represent different tasks that may bring up different motives for participation.

The present study is a part of a larger survey which also comprises the data as regards to other ELT courses in the department, namely, Reading-and-Vocabulary, Listening-and-Pronunciation, Speaking and Advanced Writing. After triangulating the results with follow-up procedures as interviews to discover ELT students' motives for non-participation, it seems ultimately possible to devise a comprehensive scale to be used in all ELT courses. The scale is intended to constitute an instrument by which ELT instructors will be able to measure the extent of their students' perceived classroom participation and reasons for non-participation, with the goal of improving learning environments.

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## **BY WHATEVER MEANS: LEARNING EXPERIENCES THAT ENGAGE NET GEN STUDENTS AT AN HISTORICALLY BLACK UNIVERSITY**

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### **Abstract**

The students of today's generation are frequent users of electronic tools and depend on the use of technology for their daily rituals. Because they are easily bored with traditional learning methods Digital Age students want more varied forms of communication (Oblinger and Hagner, 2005), desire active, engaged learning experiences (Prensky, 2006), and want more hands-on approaches to learning (Hay, 2000). However, these students often lack information literacy skills and their critical thinking skills are weak (Oblinger and Oblinger 2005). Many educators in Higher Education have turned to active learning and project-based learning as more potent ways to engage these students. This poster session will describe and showcase the use of active learning strategies and project-based learning experiences that engage students at an HBCU (Historically Black Colleges and Universities) in the course content of a mass communication course while developing critical thinking and improving information literacy skills - consequently meeting the Net Gen students where they are and moving them towards a deeper understanding of course content and the application of knowledge.

**Keywords:** *Active learning; Project-based learning; Student engagement; Net Gen students; HBCUs.*

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**DIGITAL LIFELONG LEARNING: A STUDY ON TURKISH  
UNDERGRADUATE LEARNERS STUDYING IN 21<sup>ST</sup> CENTURY  
DIGITAL SOCIETIES**

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**Abstract**

Digital lifelong learning is the personal, civic, social and academic development process of the learners in terms of knowledge, skills and competence in the long run (from cradle to the grave/ from childhood to the retirement) by the help of digital technologies such as MOOCs, Web 2.0 tools, Web 3.0 tools, social networks and online seminars. These aforementioned digital technologies have also been actively used in Turkish universities for years within the aim of providing more qualified and efficient learning experience to the learners. Even though Turkish undergraduate education system is mostly constituted by learners who can be called as digital natives in Prensky's (2001) term, it is a fact that these learners cannot get the most benefit not only from the digital materials introduced them by their educational institutions but also the ones they reach via the Internet by themselves. In this respect, this study tries to test the hypothesis of; Turkish undergraduate learners do not have the digital lifelong learning skills required in 21<sup>st</sup> century societies. The samples of this study are 200 Turkish learners studying at Anadolu University, one of the most populated universities of Turkey. The data is going to be collected via LLS (Lifelong learning scale). At the end, the quantitative data from the questionnaires is going to be analyzed by means of descriptive statistics and conclusions drawn from the data are going to be used to find ways to help Turkish learners get the most benefit from the digital technologies and materials.

**Keywords:** *Digital lifelong learning, digital societies, Turkish learners.*

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## ANALYSIS OF PIBID CONTRIBUTIONS TO THE INITIAL TRAINING OF CHEMISTRY TEACHERS

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### Abstract

Initial training of chemistry teachers in Brazil has in the past decade the support of PIBID (Program Institutional Teaching Initiation Scholarship), a program for the improvement and appreciation of teacher training for basic education. The research mentioned in this work refers to the PIBID Chemistry project, developed in IFG - Campus Itumbiara, and was based on the assumption that the participation of the student's college degree in chemistry in PIBID project contributes, in their training, to a more dynamic and assertive performance in the classroom in high school. The analysis of the actions developed in the project, in cooperation with the supervising teacher of high school and the teacher's college, points out the positive relation the experience and reflection-action on the school's teaching practices and student-teacher training. The performance of undergraduate students in the school environment has allowed for several own activities of the teaching profession, especially the didactic transposition of content through play activities and games and experimental classes, to promote the teaching of chemical concepts. The students in chemistry degree course and the project, which now act as teachers, highlight the importance of the teaching profession experience promoted by the program, which also allows the integration of basic education with the knowledge produced in the academic environment also favors perception of the role of formal education in the constant construction of knowledge of everyone involved in the educational process.

**Keywords:** *Learning in chemistry, School training, Insertion in school, School practice.*

### 1. Introduction and context

The context presented for the undergraduate courses in the country shows a diminishing demand for the teaching profession. In this scenario of devaluation, the Initiation to Teaching Grants Program – PIBID (acronym in original language) came into being in 2007, with the aim of encouraging the training of teachers at the higher level for basic education, contributing to the valorization of teaching and raising the quality of initial training of teachers in undergraduate courses, promoting the integration between higher education and basic education.

This integration can be promoted in the form of a collaborative partnership, which according to Schnetzler (2014) "emphasizes the interaction of teacher, future teacher and teacher trainer, who in a collective research on real problems of teaching practice in concrete school contexts".

The PIBID now serves more than 90 thousand students of undergraduate courses in the country, in several areas of knowledge. However, it should be borne in mind that:

"Pibid, however, is not simply a scholarship program. It is a proposal of encouragement and valorization of teaching and improvement of the process of training teachers for basic education. The undergraduate students carry out pedagogical activities in public schools of basic education, contributing to the integration between theory and practice, for the approximation between universities and schools and for the improvement of the quality of Brazilian education. In order to guarantee the educational results, the scholarship holders are guided by area coordinators - undergraduate teachers - and supervisors - teachers of the public schools where they carry out their activities " (Guimarães, 2014, p.5).

The research referred to in this work refers to the PIBID Química project, developed at IFG - Câmpus Itumbiara, and evaluated the contribution of undergraduate student participation in chemistry in the PIBID project for its initial training, aiming at a more dynamic performance and assertive in the middle school classroom of basic education.

## 2. Methods

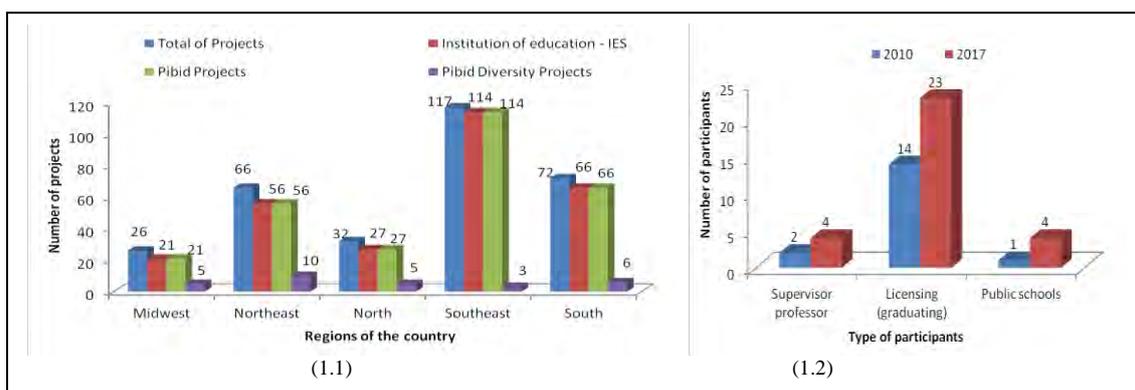
For this work, we chose the qualitative bibliographic research, carried out in the semi-annual reports of activities elaborated by the coordination of the subproject area and documents made available on the PIBID website (<http://www.capes.gov.br/educacao-basica/Capespibid/reporting-and-data>).

The material obtained was investigated according to the content analysis of Bardin (2011), in three phases: pre-analysis, material exploration and treatment of results and interpretation.

## 3. Results and Discussion

The degree course in Chemistry of the IFG - Campus Itumbiara began its activity in PIBID in 2010 and until 2017 had 65 students and 7 teachers from the basic school, due to the rotation of participants. Figure 1 highlights the growth of the program in the IFG - C. Itumbiara (1.2) that is related to the activities carried out in schools, in a collaborative partnership and the data available on the program's website for projects under development in 2014 (1.1).

Figure 1. (1.1) PIBID projects in 2014, by region of the country; And (1.2) amount of involved in the project in Itumbiara in the period of 2010 and 2017.



The content analysis carried out in the reports allowed the organization of 5 categories: Practical / experimental classes, Play activities / games, mini-courses, co-orientation. In all categories, the common characteristic is the joint organization with the supervising teacher (PS), who also acts as a guide, but the accomplishment of the activity under the responsibility of the student.

- Category "Practical / experimental classes": it is the category that appears in greater prominence, that is, the type of activity most executed in schools. It should be noted that the partner schools have a physical space designated as a science laboratory. This environment was conducive to the development of experiments with alternative materials (Figure 2 - 2.3).

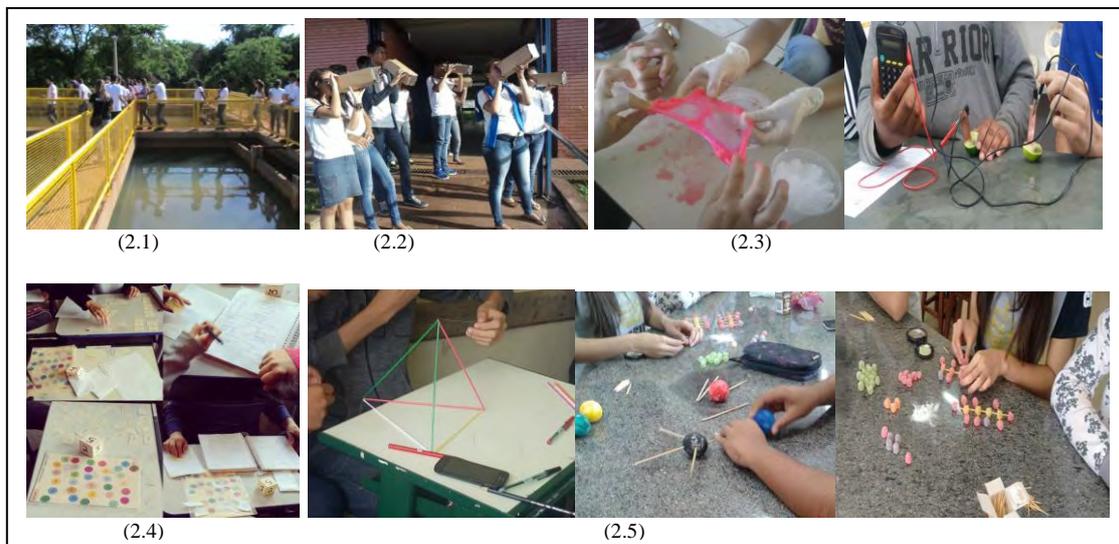
- "Leisure activities / games" category: the design and execution of these activities was identified as potential for interaction between students in basic school and undergraduates. (Figure 2 - 2.4 and 2.5)

- "Mini-courses" category: these activities sought to coordinate different techniques (expository classes, practices and games) in order to deal with different subjects (photography, radioactivity, hair chemistry, etc.) (Figure 2 - 2.2).

- "Co-orientation" category: act as co-supervisors in activities and projects for school shows. This activity contributes to the graduation of students as assistants and counselors, awakening them to the need of research as a teaching methodology. (Figure 2 - 2.1)

The five categories are also identified in the supervisors' view. For them, the PIBID students are inserted in the teaching-learning context of the partner school, which allows their development in relation to the teaching practices and allows reflection and action on these practices. With the active participation in the school environment, the undergraduate student can re-signify his / her knowledge about the specific contents and didactic-pedagogical work done in the course.

Figure 2. Examples of activities developed in the project  
 (2.1) Technical visit at the water treatment plant (2010); (2.2) Mini-course on photography (2012);  
 (2.3) Practical class (2014/16); (2.4) Educational games (2016);  
 (2.5) Play activities with alternative materials (2016).



#### 4. Conclusions

The PIBID makes a significant contribution to progress in the academic and professional fields of students. The daily life experience of the elementary school is presented as an extremely positive factor for professional growth, because in this real environment, they not only observe, but reflect and react to solve problems arising from day to day school, involving the act of Classroom, but that transcends it, involving all the stages from the planning of an activity to the interpersonal relationships originated from this practice.

Still according to the teachers (PS), the graduates present a coherent academic position, demonstrating that they have knowledge with the theoretical references worked. In relation to the production of play materials, laboratory practices and room participation, they demonstrate creativity, knowledge of experimental procedures, and ability to adapt to the reality of the space and infrastructure available to the school for their work. As for the moments of participation in the classroom for the application of the recreational materials produced, the students interacted completely with the students of the referred series, which addressed the scholars as teachers.

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## ANALYSIS OF STUDENT'S QUESTIONS IN THE TEACHING PROCESS

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### Abstract

In the framework of the research project entitled “The Didactic culture of school”, the authors of this paper have selected the teaching process as the object of study. Observation in the teaching process was directed at the student questions. By observing the student questions from different perspectives the authors could examine symmetry between the teaching communication and the students’ curiosity. The authors approach the students’ questions from a didactical point of view, defining them as a path to knowledge. Symmetry (or its absence) is observed in relation to interactive context and with consideration of the participation of all stakeholders in the teaching process. The results of previous studies confirm and point to the marked asymmetry of the teaching process, the dominant position of teachers and the subordinate position of students.

The problem of this research focuses on the analysis of the questions students ask during classes which introduce new curriculum content. The goal is to determine the symmetry (or asymmetry) of teaching communication and to analyse the questions raised by students.

The specific research questions to be answered are:

1. Does the number of questions raised by the teaching process subjects confirm symmetry in teaching communication?

2. Does teaching communication encourage students’ spontaneity and curiosity?

The sample for analysis are teachers and their students (age 10-12). The materials for the analysis are video recorded lessons in which new curriculum content is taught.

**Keywords:** *Teacher, student, student questions, symmetry, communication in teaching.*

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### 1. Introduction

Symmetry relates to power and responsibility in relation to the quality of the process, and the consequences it has for individual or the community (Juil, Jensen, 2010). Symmetric communication presumes that the subjects have equal status and competence, but teaching communication clearly involves unequal subjects, where one is supposed to lead the other to a goal. In the teaching process, it is most often a case of verbal domination by the teacher, so asymmetry is found in teaching communication, where the student's position is subordinate. On the one hand, this asymmetry may be justified by the nature of the educational context, which is asymmetrical in principle, and which occurs in order to help and support students in the development of their capacities (Bašić, 2015). On the other hand, bearing in mind the interactive context of teaching process, the inequality of positions is questionable (Peko et al., 2014).

Some research clearly indicated the asymmetrical nature of teaching communication, the fact that a student only asked one question every third day (Langer, 1974), and that in 30 percent of teaching hours not a single question was registered by a student. Jurić, studying students' questions in classes showed (1974) that in teaching there is verbal domination on the part of the teacher. An asymmetric form of communication has also been found in other empirical research, and the domination always relates to the teacher's speech, whilst the student's speaking activities are negligible (Peko et al., 2014).

### 2. Methodology

The problem of this research focuses on the analysis of questions students ask during classes introducing new curriculum content. The goal is to determine the symmetry (or asymmetry) of teaching communication and analyse the questions raised by students.

Specific research questions to be answered are:

1. Does the number of questions raised by the teaching process subjects confirm symmetry in teaching communication?

## 2. Does teaching communication encourage students' spontaneity and curiosity?

The sample for analysis are teachers (N=5) and their students (N=124). The materials for the analysis are video recorded lessons in which new curriculum content is taught. When forming a sample, it is difficult to align all the aspects of the teaching process, and the principle of the voluntary nature of the teacher's consent was a crucial criterion. The age of the students was in a range of ten to twelve years, in the fourth to sixth years of compulsory elementary school education. The type of lesson in all the teaching situations observed was equivalent. The dominant form of work was the free choice of the teacher, and in the sample it ranged from a dominantly frontal form of work, through a combination of frontal and group work, dominantly group work in research oriented teaching, to integrated teaching.

The students' and the teacher's questions in the first research question are expressed in frequencies, and in the second question in frequencies and descriptively.

Table 1. The structure of the observed sample.

| STRUCTURED OBSERVATION OF TEACHING - SAMPLE |      |                       |                               |                 |
|---|------|-----------------------|-------------------------------|-----------------|
| No.   | Year | Dominant form of work | Type of lesson                | No. of students |
| NS1   | 5    | Frontal               | Learning new teaching content | 19              |
| NS2   | 5    | Group work            | Learning new teaching content | 25              |
| NS3   | 6    | Group work            | Learning new teaching content | 30              |
| NS4   | 4    | Integrated teaching   | Learning new teaching content | 22              |
| NS5   | 4    | Frontal/group         | Learning new teaching content | 28              |

## 3. Results and interpretation

In the search for an answer to the first research question, we considered teaching situations, focusing on the teacher's speech and the students' speech. In reply to the research question set, we used the number of questions asked in the observed lessons, and their ratio (the teacher's questions in relation to the students' questions). In the speech of the teacher and the students we focused exclusively on the questions asked by the teachers and students in communication within the lesson. The questions are expressed in frequencies, and, on the basis of the ratio of questions asked, the level of symmetry was established, which appears in this research in a range from extremely asymmetric (ratio 1:20), asymmetric (1:7, 1:4.5) and symmetrical (1:1.4; 1:1.8)

Table 2. The replies to the first research question<sup>1</sup>.

| ESTABLISHING THE SYMMETRY OF TEACHING COMMUNICATION BY MEANS OF THE QUANTITY OF QUESTIONS |     |    |                        |
|---|-----|----|------------------------|
| NS  | P1  | P2 | SS                     |
| NS1   | 103 | 5  | Extremely asymmetrical |
| NS2   | 77  | 17 | Asymmetrical           |
| NS3   | 41  | 22 | Symmetrical            |
| NS4   | 28  | 20 | Symmetrical            |
| NS5   | 58  | 8  | Asymmetrical           |

Examination of the results of the research revealed the asymmetry of communication in most teaching situations. The most asymmetry was seen in teaching situation 1, where the ratio of questions asked was 1:20 in favour of the teacher. This lesson was extremely controlled and the teacher's speech was visibly dominant. The students' questions were not an expression of the students' interest, but related to lack of clarity in the instructions the teacher gave to the students.

We can diagnose the symmetry in teaching communication in teaching situation 4, and partially in teaching situation 3. In view of the fact that teaching situation 4 was the only one where the principles of integrated teaching were used, it may be assumed that integrated teaching encourages symmetrical communication. The spatial and social factors of integrated teaching contribute significantly to the symmetry of communication, because it may be noticed even in the students' movements. The movement of students around the classroom was equally represented as the movement of the teacher, in contrast to teaching situation 1, where the teacher moved about the classroom whilst all the students remained seated. The teaching situations observed opened up many new areas for research. The first is aimed at studying integrated teaching and its possibilities for development of symmetrical communication, the problems of movement by students, and the level of physical activity. Another direction is aimed at the time period of waiting for answers to questions, the emotional reaction of fear in students when asking a question, and analysis of the teacher's speech (in terms of time and content).

<sup>1</sup>NS: teaching situation observed, P1 - teacher's questions, P2 - students' questions, SS - the degree of symmetry of teaching communication

Table 3. The replies to the second research question<sup>2</sup>.

| SPONTANEOUS STUDENTS' QUESTIONS AND STUDENTS' CURIOSITY |          |   |   |
|---|----------|---|---|
|   | $\Sigma$ | Z | Description   |
| NS1   | 5        | 0 | None of the questions was an expression of the students' interest. All the questions were aimed at lack of clarity in following the teacher's instructions or asking permission to do certain things  |
| NS2   | 17       | 1 | Only one question was an expression of the student's interest as the result of the lack of clarity of the teaching content  |
| NS3   | 22       | 4 | The students' questions were the result of the teacher's encouraging the students' interest and were not an expression of the students' spontaneity.  |
| NS4   | 20       | 8 | Students were spontaneous in activities, asking questions which were the product of their interest. The content of the teaching unit was suitable for their interest/curiosity (the central topic of integrated learning: "If trees could walk"). |
| NS5   | 8        | 1 | The student's interested question was an expression of the student's personality.   |

The student's interest is an excellent indicator of the student's position in the lesson. It shows whether the student's role is active or passive, and which values are encouraged in the class. It also gives an answer to the question whether a receptive relationship in the students is supported by the lesson. If our aim is to develop students into capable, active and responsible individuals, their position in the classroom is important. By responding to the students' needs related to the desire for knowledge, we aim the lesson at the student and bring him/her into an active position. Students' interest in the form of questions had very little room in the sample observed. It was most visible in the teaching situation aimed at integrated learning. The authors assess that the very content of the teaching unit was suitable for developing interest, and that the implicit pedagogy of the teacher running the class was aimed at encouraging and developing the students' interest. In this class the atmosphere itself was assessed as encouraging, pleasant and relaxing. Education through responsibility and not obedience was visible. In the third teaching situation the students' questions were a response to the teacher's prompting and were not a sign of the students' spontaneity. The authors presume that the most spontaneity arises in forms of work which encourage mutual communication between students, and that the students' interest intensifies during work in pairs and in group forms of work. In the other teaching situations, the students' interest and spontaneity were completely or almost completely lacking. The passive role of the students was visible, and the relationship is: the teacher teaches and the student is taught. The answers to the second research question opened up new research areas related to the connection between various forms of work and symmetry in communication, as well as the atmosphere in the classroom and the implicit pedagogy of teachers and their connection with symmetry in teaching communication.

#### 4. Concluding Remarks

The results of this research indicate asymmetry in teaching communication. It was visible in the domination of questions asked by the teacher. The students' position, in terms of the observed quantity of questions asked and students' interest indicate passivity. We point out that this research was undertaken in different subject areas but equivalent types of lessons were considered. The research opened up many other research questions, and the subject of the research may be linked with the classroom atmosphere, the students' emotional reactions, the quality of questions, the amount of time given for answers and the implicit pedagogy of teachers. The authors of this paper uphold the suggestion of authors who, when studying the didactic culture of a school, pointed out the great importance of "pedagogy of question" and "pedagogy of answers" in the process of raising the quality of the teaching process (Bowker, 2010).

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<sup>2</sup>NS: teaching situation observed,  $\Sigma$  Total number of students' questions in the teaching situation observed, Z - The number of questions which are an expression of the pupils' interest related to the content

## REFLECTIONS ON THE LEARNING OF CHEMISTRY IN EJA: FOOD COLORINGS AS CONTEXTUALIZATION POINT

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### Abstract

This work aims to discuss the difficulties presented by the students for learning chemistry, using as a focal point the theme "food colors" through a contextual approach. The reported didactic proposal in this work was completed in high school chemistry class of the Youth and Adult Education - EJA (2nd half of the 3rd stage) with supervision and coordination of the teaching of the partner school. The methodology involved the application of a diagnostic questionnaire to the students to guide the elaboration of a didactic sequence on the chosen theme and its execution. The proposal elaborate was directed to the realization of practices by the students, especially the extraction of natural dyes, analysis of the labels of foods and drinks and simple chromatographic analysis, addressing the separation of dyes present in commercial candy. The students presented difficulties with the technical approach of the theme, but correctly related the concepts that were treated in a way closer to their experience. The activities allow to conclude that the teaching of chemistry to students of the EJA should consider, among other factors, the popular knowledge that the students take to the school and bring it closer to the scientific knowledge, so that the students can give meaning to the actions proposed by the school.

**Keywords:** *Learning in chemistry, Contextualization, Young and adult education, School practice, Popular knowledge.*

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### 1. Introduction e Objectives

Youth and Adult Education - EJA (acronym in original language) is a youth and adult education programme, which allows students who were denied earlier access to education, a second. The formative process of this modality have the functions of reparation, equalization and qualification (Brazil, 2010). As a modality of Basic Education, the EJA must develop in its curricular organization the discipline of Chemistry, which is a science that is not solely limited to laboratory research and industrial production, but which is also present in our everyday life in a wide variety of ways.

The purpose of this work was to provide students with activities that allowed the contextualization of scientific knowledge through the use of the synthetic dye theme, and to explore experiments that could be applied even without the materials and equipment of a laboratory. Faced with the huge variety of industrialized food products we have access to, it is necessary that the choices are made with safety and conscience and not just considering the price. So, the chosen theme also presents social connotation, since it allows to discuss aspects related to the consumption culture. The objective of this research was to provide contextualized chemistry teaching with the aim of improving learning outcomes.

### 2. Conceptual framework

The idea of contextualization arose with the reform of secondary education, starting with Law 9394 of 1997, the Law on Guidelines and Bases of Education (LDB) that guides the understanding of the knowledge from the everyday of the students, and to guide the educational actions directed to the teaching of chemistry. The National Curricular Parameters (NCPs), directs that the teaching of chemistry be

centered on the interface between scientific information and social context, where "to contextualize chemistry is to promote a link between the student's knowledge and daily life, is to propose real situations and seek the knowledge necessary to understand them "(Brazil, 2002, p. 93).

The research in the teaching of chemistry in Brazil has advanced and several authors defend the use of contextualized approaches as a way of promoting a meaningful learning (Santos and Schenetzler, 1996, Bonenberger and Silva et al, 2007, Wartha Silva and 2013, Agostinho and Nascimento, 2012. According to Mortimer (2003), in order for a teaching-learning process to be effective, it is necessary for learning to be meaningful in order to understand the concepts related to the students' previous conceptions. In this sense, the experimental activities help consolidate the student's knowledge and development. In the teaching of chemistry, the experience of real situations is of great importance for the understanding and correlation of the various contents.

### 3. Methods

Educational action research is a strategy for the development of teachers and researchers so that they can use their research to improve their teaching and, consequently, the learning of their students (Tripp, 2005). In this perspective, the theme "Synthetic Dyes" was developed in a public school in the city of Itumbiara, Goiás, Brazil, with students from EJA - Ensino Médio (2nd semester of 3rd stage), in the night shift, with the purpose of contextualizing contents to facilitate the construction of concepts by the students. The methodology of the work was organized in 3 steps:

- Step 1: a bibliographic survey was carried out with search for articles with the following key words: food colorings, synthetic food colorings, experiments, and chemistry teaching.
- Step 2: a questionnaire was used as a research instrument, which aimed to identify some relations of knowledge and consumption of synthetic dyes.
- Step 3 was dedicated to the elaboration and execution of a didactic sequence, a set of activities linked to each other, organized with the purpose of achieving student learning, and which can stimulate learning and evaluation activities. The didactic sequence was elaborated with experimental and theoretical activities, based on the works of Dias, Guimarães and Merçon (2003), Fraceto and Lima, (2003) and Ribeiro and Nunes (2008), and involved: extraction of natural dyes, Food and beverage labels, simple chromatographic analysis, separation of dyes present in commercial sweets, and interventions performed through information on the use, consumption, benefits and harm present in synthetic dyes.

### 4. Results and Discussion

The application of the questionnaire was done in advance so that their analysis guided the planning of the didactic sequence and the experimental activities to be carried out. In the research area, it was verified that the students of EJA consume a diverse range of natural and industrialized food products with the presence of dyes, mainly with the colours green, red and yellow (natural foods) and yellow, white, black and orange (processed foods). Although they recognized the presence of dyes in foods (83.3%), they did not know whether or not they knew what a synthetic dye was, nor were they able to give examples of these substances. Nevertheless, 41.7% reported that the role of colorants is to "color" food. Analyzing the issues of consumption behavior, only 33.4% of students usually read the label of the processed foods they consume, mainly observing the expiration date. They did not care about which dyes they were consuming, which may be related to the fact that they did not know people with allergy to these substances.

The analysis of the questionnaires demonstrates that the theme dyes could be developed with the students, and promote discussions about the function and applications of these substances. The proposed and developed didactic sequence was organized in stages, and started with a dynamic called "brainstorming", on natural and synthetic dyes, to introduce an experimental activity of extraction of natural dyes, using cabbage (chlorophyll), carrot (beta (Beta-carotene), beetroot (betalain), turmeric (curcumin) and urucum (bixin) and their use as acid-base indicator substances, allowing students to explore the chemical concepts of solubility, and pH (ie, acid and alkaline substances). In order to treat the synthetic dyes, it was proposed to the students to perform the paper chromatography technique for the separation of dyes in sweets, Fraceto and Lima (2003).

This separation technique prompted students to check the label of the product under review, as they interpreted the color of the product to be a "single color" and, in carrying out the practice, found that a color can be formed by a mixture of dyes. This allowed us to discuss the application of synthetic dyes in foods as a function of the properties of these substances in conferring uniformity, optimize costs, intensify colour and confer attractive appearance to the product. On the other hand, they are substances with no nutritional value, which led the students to consider and discuss the commercial appeal of these products.

Considering the proposal to apply the contextualization in the teaching of chemistry, this work made possible the contextualization through two categories, according to Costa and Field's (2016): experimentation and daily life. The moments of discussion between the students and between the students and teachers, characterized that the learning occurred in a significant way, because the students gained knowledge of the subject and managed to explain it to their colleagues.

The experimental approach taken allowed the students to expand their chemistry knowledge and at the same time put their learning into a wider context outside the classroom.

## 5. Conclusions

The difficulties presented by EJA students are usually justified by them for the long time outside the school environment and the need for dedication to work. However, the use of contextualization was motivating for these students to interact with the information and give meaning to it, demonstrating that although they fit outside of regular school age, the knowledge they bring of their experiences, when appropriately associated with the School activities can contribute to the construction of scientific knowledge in a meaningful way.

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## AUGMENTED REALITY IN THE K-12 CLASSROOM

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### **Abstract**

Augmented Reality has the potential to be the fourth wave of disruptive technology in education; the worldwide phenomena that was Pokemon Go revealed a global appetite and wonder at this form of technology. Harnessing this technology, using it in the classroom to increase engagement and provide a platform for deeper learning is something that seems beyond the scope of teachers and schools. This workshop reveals otherwise. Through a series of demonstrations, the workshop lifts the veil on how this technology can be used and, most importantly, showcases how students and teachers can create their own augmented reality learning experiences free of charge. It's not only an exciting addition to the teacher tool-kit, but one with unparalleled potential and one that can alter the way schools view learning - imagine an augmented reality corridor where posters literally come alive, or textbooks where augmented images spring from the pages. The potential is only limited by the creator's imagination once they have been introduced to the creation tools. A simple workshop that will leave a lasting impression and, more importantly, provide a new and exciting avenue for learning.

**Keywords:** *Augmented Reality, Disruptive Technology.*

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## LOOKING AT US PUBLIC SCHOOL DEMOGRAPHICS AND PERFORMANCE

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### Abstract

This study utilized data from the National Center for Education Statistics (NCES) and the National Assessment of Educational Progress (NAEP) to develop interactive maps using Geographic Information Systems (GIS) to combine school and district level data with geolocation. The maps identify the ethnic diversity for public school districts within the United States (US) that had reported NAEP. Layers included students who are identified as: American Indian/Alaska native, Asian or Asian Pacific islander, black, Hawaiian native/Pacific islander, Hispanic, two or more races, or white. The maps visualize performance data through NAEP scores from 22 of the largest urban school districts in the US and how it related to the identified populations. Students in grades 4 and 8 participated in this national test. Analysis examined student to teacher ratios as well as free and reduced lunch status and how it relates the ethnic diversity of the school district. Ethnicity was considered in terms of school percentages rather than raw numbers in order to provide a more accurate representation.

**Keywords:** *GIS, US Public Schools, Ethnicity, Performance, Teacher-student Ratio.*

### 1. Data and Demographics

This study combined data publically available from the National Center for Education Statistics (NCES) and the National Assessment of Educational Progress (NAEP) to develop interactive maps using Geographic Information Systems (GIS). NAEP scores are reached through sampling. "In an average state, 2,500 students in approximately 100 public schools are assessed per grade, for each subject assessed (Allen, 2011). Districts were located visually through latitude and longitude coordinates. After cleaning, the data were analyzed at a school level data resulting in nearly 80,000 schools with usable data. Visualizing this is demanding for current market software and hardware, however, of greater importance, school data was not available for the states of Indiana, Texas, and Washington. You can see the gaps in visualization for these states in Figure 1, as well as, how potentially congested the national map appears. With Texas holding 3 of the 22 districts reporting NAEP scores (scores which were reported as a district average, not individually by school) it was unacceptable to continue at an individual school level.

*Figure 1. Public Schools in the United States.*



Concerning student demographics, the category of “other” was selected rather than solely Asian, as there were insignificant numbers for students of American Indian, Hawaiian, etc. decent to field categories of their own. The category of “other” is primarily comprised of Asian students. Figure 1 displays student enrollments by demographics in the 22 urban districts participating in NAEP assessments. Gray signifies the percentage of students within a school who fit the designation of “other”, blue represents white students, purple black students, and orange Hispanic students. Visually it is clear that there is a greater number of black students in the eastern side of the US. There are clearly more Hispanic students enrolled in the large southern districts. None of the urban districts observed held more than 50 percent white students, a vast majority were at less than 25 percent. Students representing the category of the “other” were a clear minority in these urban school districts and only five districts held numbers in the 10 to 25 percent range. Table 1 provides a sampling of the 5 largest districts. All of the table information (and significantly more) is available by selecting the colored dot representing the district on the map. In this regard, the data that would typically require a large, even multiple page table can be represented visually. As for being able to digest the data at large, this would be taxing for the typical participant to delve through and retain the relevant data of (in this case) 22 urban districts. With shared link, this could be interacted with by stakeholders and layers of interest selected, deselected, or modified as visually desired.

Figure 2. Student Demographics for 22 US School Districts.

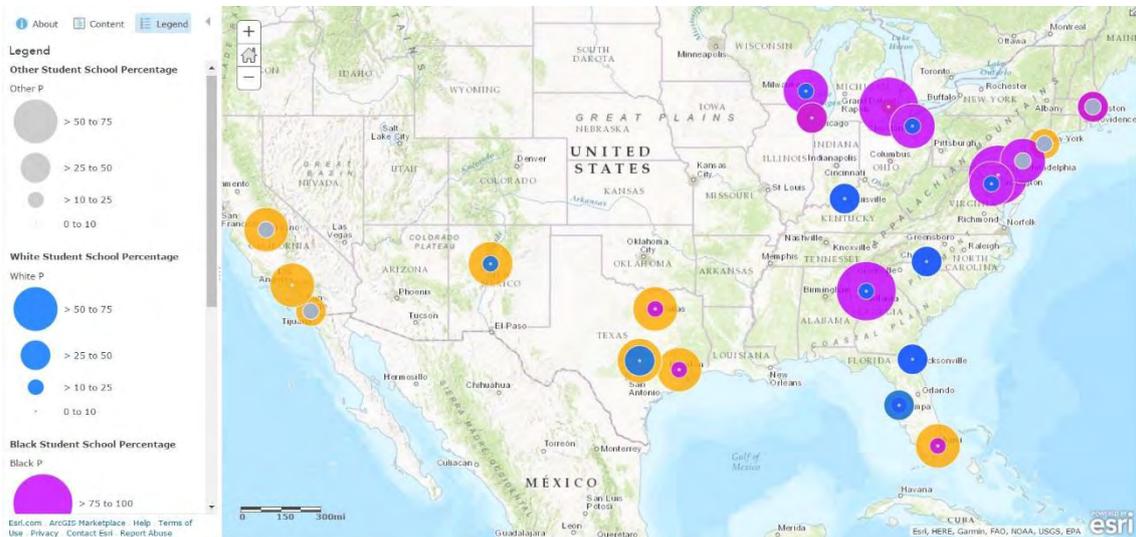


Table 1. Sample of Student Demographics for the 5 Largest Reported US School Districts.

| District    | Total   | Other N | Other % | White N | White % | Black N | Black % | Hisp. N | Hisp. % |
|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| New York    | 960,834 | 180,611 | 18.8    | 151,022 | 15.7    | 243,268 | 25.3    | 397,424 | 41.4    |
| Los Angeles | 643,823 | 49,928  | 7.8     | 63,385  | 9.8     | 56,863  | 8.8     | 476,507 | 74.0    |
| Chicago     | 391,447 | 20,634  | 5.3     | 37,563  | 9.6     | 154,826 | 39.6    | 179,535 | 45.9    |
| Miami-Dade  | 356,964 | 6,339   | 1.8     | 26,650  | 7.5     | 80,089  | 22.4    | 243,886 | 68.3    |
| Houston     | 215,225 | 10,289  | 4.8     | 17,950  | 8.3     | 53,501  | 24.9    | 133,485 | 62.0    |

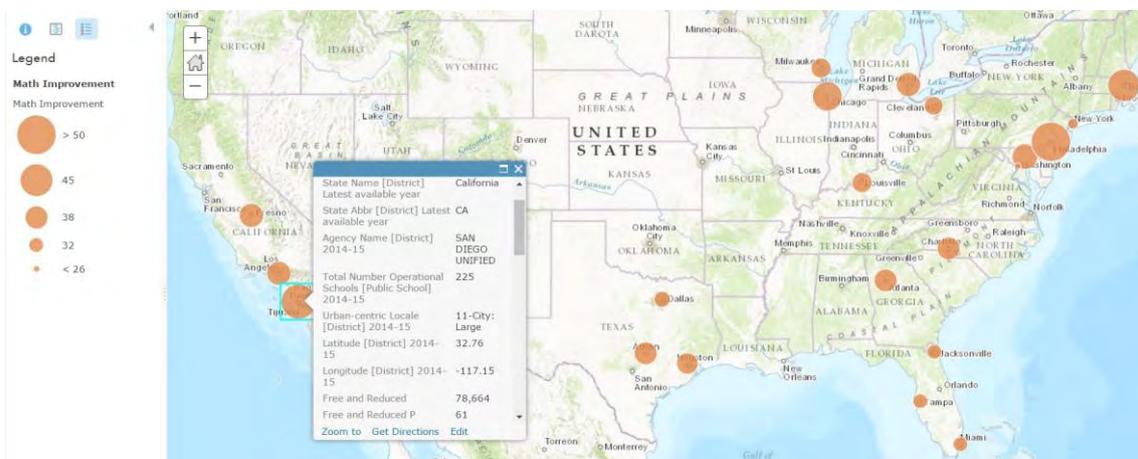
## 2. Math Scores

Layers were created for grade 4 math, grade 8 math, and math improvement scores. Figure 3 show the particular scale district averages fell within as well as their corresponding color. Scores ranged from the highest scores (darker green) of greater than 243 to the lowest scores (darker red) of less than 220. As with other map layers the school dots are interactive where the stakeholders could examine the district(s) of interest and find all of the related data through a click of the point on the map. Math improvement scores were generated through the difference grade 8 and grade 4 scores. There are certainly limitations using this method as it would not be the same 4<sup>th</sup> grade students 4 years later. However, one must bear in mind all of these scores are a sampling and only reported as a district average. Figure 4 provides a visualization where one can quickly see which districts had the greatest improvement. The San Diego Unified District was also selected to provide an example of the data one can view at each interactive point. The text can be scrolled down to view all pertinent data to the point. In this case, data ranging from location to demographics to assessment scores.

Figure 3. Grade 4 Math Scores for 22 US School Districts.



Figure 4. Math Improvement Scores Grade 4 vs Grade 8.



### 3. Reading, Science, and Writing Scores

Though not shared visually in this paper, in all but 2 districts, reading scores improved by more than 31 points in grade 8. 18 of 22 districts reported science scores for both grades 4 and 8. However only 5 districts had improved scores in grade 8, 5 had no change, and the remaining 8 actually had lower scores reported among their 8<sup>th</sup> grade students. Only 6 school districts provided grade 4 writing scores and only 11 districted reported grade 8 writing scores. As such comparisons were limited beyond visualizing location and scale of score.

### 4. Conclusion

Using GIS provides users and more importantly stakeholders an interface to rapidly visualize and explore relevant data. With the available data analyzed, it is possible to see which districts are performing well or poorly. Other layers can be presented ovetop/underneath to share student to teacher ratios, demographics of the district, or free and reduced lunch status. For example 97% of students in the District of Columbia receive free and/or reduced lunch (an indicator of socioeconomic status in US schools) where only 44% of students in Duval County receive free and/or reduced lunch. District efforts toward test score improvement can easily be tracked. With access to school level data, stakeholders could identify specific school performance along with intervention success or failure. An expanded document would share these findings and allow for further discussion of areas already briefly touched upon.

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## M-LEARNING TOOLS FOR DISADVANTAGES STUDENTS – MRIDGE PROJECT

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### Abstract

The use of mobile devices and related to them digital resources for the purposes of educational and social integration is an innovative solution of a need, which has arisen in society.

Mobile technologies give freedom both to teachers for complex presentation, and to students for extended study of a considered problem in accordance with their educational needs, what, according to the constructivist views, is a condition for manifestation of independence and initiative.

The application of these technologies overcomes the limitations related to time, place and volume of the school material. The students can use these technologies both in the classroom and out of it in convenient time, and they can access a wealth of information resources.

The use of these technologies does not require from the student's preparation in advance. The interactive multimedia products are usually complied with their intuitive perceptions and their personal preferences and offer very good possibilities for building up steady interest and lasting motivation.

One of the latest trends in studying the educational process is related to integration of popular and widely used electronic technologies.

The project *Using mobile technology to improve policy Reform for Inclusion of Disadvantaged Groups in Education - mRIDGE* is focused on the design of new applications for mobile technologies for stimulation and support of implementing innovations in the education of the following disadvantaged groups: roam children and their teachers, hearing impaired children and their teachers, people with musculoskeletal disorders, unemployed people.

**Keywords:** *m-learning, disadvantaged groups, multimedia digital resources.*

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### 1. Introduction

At present the use of mobile technologies is mostly in the sphere of services and entertainment and very limited in education and work. Since nowadays every active person has at least one mobile device, this is the only technology, used in education, which does not require additional investment for buying equipment for learning as the trainees already have it.

Every year Horizon Report (a joint report of New Media Consortium and Educause) identifies and describes the technologies, which could have big influence on teaching and learning in the next five years. In the reports for 2011, 2012 and 2013 the mobile technologies, the technology of "augmented reality", as well as the open educational resources and tablets are listed as such.

After a survey of the best practices in the use and development of mobile digital resources, two main conclusions were drawn:

- The mobile devices are widely used and have a complete set of multimedia services. There are all prerequisites for their use for the purposes of education and training.
- There lacks focusing on specific groups of users. As a whole, it is assumed that all groups of users have similar needs. When the studies concern various groups of users, the results are difficult to interpret.

Precise assessment of the effectiveness of the use of mobile digital resources for educational purposes is needed and it should be based on the use of different groups of users in various educational and training contexts (Iacobescu and Mileva, 2016)

## 2. Objectives

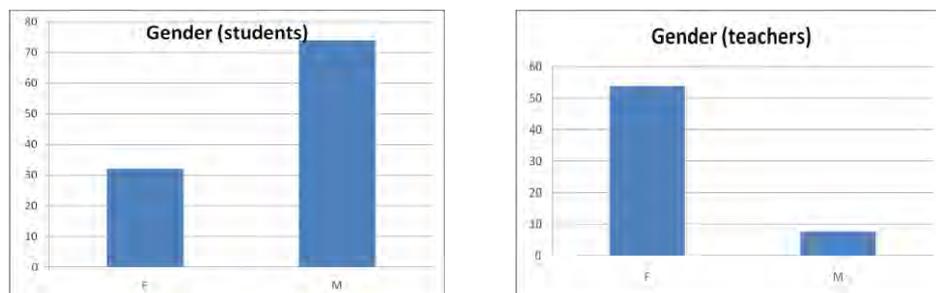
The specific objectives of the project are:

1. Analysis of user needs in different contexts and existing curriculum in Bulgaria and Romania
2. Design of Mobile Digital Resources (MDR) Model to support the didactic features of mobile technologies in order to adapt them to the training conditions of disadvantaged groups of people
3. Design of educational scenarios:
4. Development and adaptation of mobile applications and digital educational resources
5. Improvement of the present policy measures and good practices, and development of new policies and practices in the fields of disadvantaged groups and Roma young people education at the EU member states.

## 3. Methods

In order to identify the needs of using mobile technologies in learning/ teaching process for high school students and teachers, academic students and professors, we gathered information from 228 questionnaires and 8 interviews. The questioned students were between 4 and 19, the average age being 13,13. The questioned teachers were between 16 and 4, the average age being 42,19 (iacobescu, 2016). The gender distributions of the test groups are presented in Figure 1.

Figure 1. The gender distribution of the questioned people: (a) students; (b) teachers.



The first MDRs created to be included in the teaching process consist in short video records related to the educational curricula for students with special needs. They can be easily accessed by the students activating a QR code (previously assigned to each videos) customly included in the manuals by teachers. The first pilot activities were applied to students with musculoskeletal diseases and autism.

Figure 2. Using tablets during classes by a child with autisms.



After this trial, additional learning materials will be implemented to the existing ones (e-learning materials, books) for the adaptation to the learners with special needs, on the basis of assessment outcomes to ensure that the evaluation and the development are continuous interrelated processes.

## 4. Discussion

From the analysis of the data provided from the students' questionnaire, we can draw the following conclusions:

- Most students are skillful in using the mobile technologies/ devices.
- The students make efforts learn.
- They are interested to study with the help of mobile technologies/ devices in class or at home due to quick access to information.
- They would learn easier with the help of mobile technologies.
- They could be help by the others more easily when using mobile technologies.
- They consider that they would have more fun if using mobile technologies for learning.
- They would like to interact with their colleagues and teachers during their free time, outside the school, by using mobile technologies.
- They would like to assist to classes based on video movies.

From the analysis of the data provided by the teachers' questionnaire, we can draw the following conclusions:

- Learning with the help of mobile technologies can prove itself as being an effective method of learning as it can provide immediate support for disabled students.
- Learning with the help of mobile technologies brings new opportunities of learning for disable students due to the fact that visual and audio images have a greater impact on them.
- Learning with the help of mobile technologies is a more flexible method of learning if we take into account the fact that it can take place under all circumstances, regardless the time and place.
- Learning with the help of mobile technologies improves communication between the student and the teacher.
- Learning with the help of mobile technologies is a quicker method of getting an immediate feedback from students.
- Learning with the help of mobile technologies can be used in one of the following cases:
  - when the mobile phones are available even if the number of students increases.
  - when the expenses involved in the process are lower.
  - when there is good network in the school.
- It is not difficult to control the use of cell phones/laptops/tablets in class
- Students need a classroom experience which is creative and challenging.

## 5. Conclusions

As a general conclusion, we can observe that both students, as well as teachers, agree upon the fact that mobile technologies represent a useful tool in the process of teaching and learning for high school students with disabilities. Nevertheless, there is a difference in perception: the students are more interested in getting media information as quickly as possible, while the teachers are more focused on the educational benefits of the Internet. A second conclusion regards the emphasis this type of educational process puts on visual images, bringing the students closer to understanding the world.

Integrating the mobile technology in the teaching process, as multimedia resources which can be easily accessed by teachers and students improved the understanding of complex phenomena by the students with special needs.

### *Acknowledgement*

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## **A STUDY IN DETERMINING THE TECHNOPEDAGOGICAL NEEDS OF FOREIGN LANGUAGE INSTRUCTORS AT ANADOLU UNIVERSITY, TURKEY**

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### **Abstract**

It is undeniably true that in the era characterized by continuous technological development, technology has an essential role in human's life. Based on this fact, it is indispensable to take advantage of the modern technological facilities in aiding the task of foreign language education. However, it is a fact that some challenges have been experienced by teachers in the integration of technology into teaching. Such questions as 'Do the teachers have the ability to use educational technology? How can teachers integrate technology into their teaching?' are faced. Teachers may feel unconfident about using technology for instructional purposes. While for some teachers technological skill may be a concern, the greatest uncertainty rests in how to use technology in the classroom (Menke and Guikema, 2014). At this point, what is needed to overcome these challenges is to educate the teachers with the technopedagogical skills. It is considered that determining the technopedagogical needs of teachers and giving useful courses should be handled at the outset. Therefore the method of questionnaire and descriptive research are combined. The questionnaire aiming to find out needs and wishes of teachers was given to 123 instructors working at School of Foreign Languages, Anadolu University, Turkey. When the results of questionnaire that contains 6 questions one of which is open-ended were analyzed, it is obviously seen that %95.9 of 123 participants consider that technology integration in education is essential for the instructors. This high percentage has shown that there is a need changing between %49 and %89 for web tools and programmes aiming at developing skills in foreign language education. According to these results of the needs analysis, necessary trainings can be enhanced.

**Keywords:** *Technopedagogy, technology integration, teaching, educational technology.*

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## **SOCIAL MEDIA AND CELL PHONE USE AMONG STUDENTS AT A SMALL PACIFIC ISLAND UNIVERSITY**

**Mary Jane Miller**

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### **Abstract**

This study examines survey results of students from a small Pacific Island university on their daily use of technology, particularly social media and cell phones. Cell phones are universal and pervasive on college campuses and research has shown that social media and cell phone technology on university campuses represents many positive benefits and may offer greater opportunities both academically and socially for university students (Bull & McCormick, 2012). However, some studies have also noted a number of negative associations including lower student GPA and a condition that has been termed “cell phone addiction” (Lepp, Barkley, & Karpinsky, 2015). This study documents the type of media and amount of time university students report spending each day using social media and Apps such as (FaceBook, Twitter, Instagram, Pinterest, WhatsApp, Instant Messenger, LinkedIn, YouTube, etc.), and talking or texting on their cell phones.

**Keywords:** *Social media, cell phones, phone apps.*

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### **1. Introduction and Background**

Cell phones and their attendant Applications (generally referred to as Apps), Social Media, texting and email are mainstays of modern life today. This is particularly true among university students. Cell phone use, including smartphones, is especially high among university age demographics, and for many it's their only access to the internet (Smith, 2015) which is an essential tool for university success and is a primary means to access social media Apps. A study by the Pew Research Center showed that in 2015 approximately 90% of the American population owned cell phones and most of these were smartphones which provide ease of access to social media and innumerable Apps (Rainie, 2015). Among university students, Post reported that 99.8% of students have cell phones (2011), and their most frequent use is to access various social media platforms.

Cell phone use is pervasive among university students. While research has shown that social media and cell phone technology on university campuses certainly present a number of positive benefits as well as potentially greater opportunities for university students (Bull & McCormick, 2012), it is astonishing to realize that it is typical for a third of a student's waking hours to be spent using a phone (Gregorie, 2015). A recent study at Baylor University reported that female college students spent an average of 10 hours a day on their cell phones and male students averaged about 8 hours (Goodrich, 2014). Wood describes a study that found students spent most of their phone time using social media such as texting or sending and receiving email. This was followed by checking Facebook, and listening to music. Some students feel disconnected socially without their phones and get anxious when their phones are not in sight. Approximately 60 percent admitted they may be addicted to their cell phone (Wood, 2014).

With such extensive use of cell phones on college campuses reported, it is important to examine their use among students at University of Guam with an eye toward how we can most effectively use this information to enhance student engagement in coursework and strengthen learner outcomes.

### **2. Objectives**

Objective 1: With a 95% confidence level and no more than 5% margin of error, determine the amount of time students at University of Guam use Applications or social media on their cell phones each day.

Objective 2: With a 95% confidence level and no more than 5% margin of error, determine the amount of time students at University of Guam spend each day talking or texting on their cell phones.

**Objective 3:** Ascertain which phone Apps students surveyed at University of Guam report as most commonly used.

### 3. Participants

Potential participants included 3,017 students in residence attending the University of Guam. A total of 316 students participated in the study. This sample size represented a 95% confidence level with a 5% margin of error. The sample (N = 316) was comprised of University of Guam students who responded to the study's online survey questionnaire. Of the 316 participants, 135 (43%) were males, and 181 (57%) were females. The participants' age categories ranged from 291 (92%) who were 18 to 30 years old, 20 (6%) who were 31 to 40 years old, 4 (1%) who were 41 to 50 years old, and 1 (0.3%) who was 51 years or older.

### 4. Method and Data Analysis

Students attending classes from academic departments across the University were invited to participate in the online survey via e-mail and face-to-face requests. Each participant was asked to complete an on-line survey using the university's subscription to Qualtricks Research Software that would take approximately 10 minutes to complete. Participation was completely voluntary, and subjects could withdraw from the study at any time. A total of 316 surveys were completed. Data analysis was done using Qualtricks Research Software and Excel. For each survey item, descriptive statistics were presented to provide a snapshot of the participants' responses using frequencies and percentages. To test for a 95% level of confidence, the alpha level was set at 0.05.

### 5. Results

Objective 1 was to determine the amount of time students at University of Guam use Applications (Apps) or social media on their cell phones each day. The results of this survey show that most UOG students spend a great deal of time using their cell phones on a daily basis. With a demographic age range where 92% of participants were between 18 and 30 years of age, this is not surprising. About 29% of the students surveyed said they spend 4 or more hours on their phones using social media or other Apps such as games, banking or checking news reports. Of these, nearly 11% report being on their phones for 6 or more hours daily for this purpose. It is interesting that 21% said that on most days they do not use their cell phones for social media or other apps. This response is not in keeping with the national average and may be partially due to the frequency of in-class data collection, even though anonymity was assured.

*Table 1. Number of Hours students use Applications or Social Media Per Day.*

|            | <b>Hours of Application (App) or Social Media Use Per Day</b> |                    |                    |                      |              |       |
|------------|---|--------------------|--------------------|----------------------|--------------|-------|
|            | Usually 6 hours or more                                       | About 4 or 5 hours | About 2 or 3 hours | About 1 hour or less | Usually none | Total |
| Frequency  | 33  | 58                 | 57                 | 101                  | 67           | 316   |
| Percentage | 11  | 18                 | 18                 | 32                   | 21           | 100%  |

Objective 2 was to determine the amount of time students at University of Guam spend each day talking or texting on their cell phones. The time reported here is in addition to the hours mentioned in objective 1 that discusses social media and App use. Like students from other universities it appears that UOG students spend more time talking and texting on their cell phones than using other Apps. More than 47% of students report spending 4 or more hours texting or talking on their cell phones. Of these, more than 22% use their phones 6 or more hours daily for this purpose in addition to the time spent using social media or other Apps. Only .8% said that on most days they neither talk nor text on their phones.

*Table 2. Number of Hours UOG Students Spend Talking or Texting Per Day.*

|            | <b>Hours of Talking or Texting on Cell Phones per Day</b> |                    |                    |                      |              |       |
|------------|---|--------------------|--------------------|----------------------|--------------|-------|
|            | Usually 6 hours or more                                   | About 4 or 5 hours | About 2 or 3 hours | About 1 hour or less | Usually none | Total |
| Frequency  | 70  | 79                 | 104                | 60                   | 3            | 316   |
| Percentage | 22.2  | 25                 | 33                 | 19                   | .8           | 100%  |

Objective 3 was to ascertain which phone Apps students surveyed at University of Guam report as most commonly used. Below is a list of the 12 Apps most commonly reported in the survey. It is

interesting to note the number of Apps which support social media. Other than Google search and Dictionary.com there was little mentioned that was particularly academic, and it even bears consideration whether Dictionary.com was included in the top 12 primarily because the survey was done during some class times at the university.

Table 3. Apps Most Commonly Reported as used by University of Guam Students.

| Apps Most Commonly Used by UOG Students |                 |
|---|-----------------|
| 1. FaceBook                             | 7. Pandora      |
| 2. YouTube                              | 8. Gmail        |
| 3. FaceBook Messenger                   | 9. Banking Apps |
| 4. What's App                           | 10. Instagram   |
| 5. Google Search                        | 11. iTunes      |
| 6. Google Play                          | 12. Amazon      |

## 6. Discussion/Conclusions

Cell phones with their great variety of applications are an important part of campus life even among students at a small Pacific Island university. The number of hours reported by students using cell phones is truly staggering, and this number is not likely to be reduced in the near future. The impact of cell phone use is sure to be double-edged, many positives with a number of negatives thrown in just for balance. As with other campus surveys across the nation, UOG students spend most of their phone time talking, texting or using social media to stay connected with friends and family. They use them while waiting in line and don't like to put them away during class even when instructed to do so.

The primary lesson here for instructors is that, rather than "fighting" with students about using cell phones during class time, perhaps their popularity could be harnessed and incorporated into academic processes and instructional methodology. Although there will always remain appropriate and inappropriate uses of cell phones, it is possible to utilize the various Apps, social media and technology in a manner that enhances learning, actively engages students, promotes dynamic interactions, and makes assessment more immediate and relevant. Many students are so connected to their phones that they feel deprived when they cannot frequently check them. A positive instructional approach might to repurpose a common App as a teaching tool that can be used interactively during class.

This small study was a preliminary one in anticipation of a larger and more detailed study that makes correlations between hours of technology use and GPA as well as cell phone use and general physical wellbeing and health.

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# EMPATHY AND DESIGN THINKING AS A PEDAGOGICAL TOOL IN PRE-SERVICE TEACHER AND HUMAN SERVICES EDUCATION

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## Abstract

This paper considers design thinking as a pedagogical tool to support the learning of pre-service teachers and human services professionals. When engaged in design thinking children, teachers, families and other users become key participants with professionals in the design process to arrive at meaningful and creative solutions to challenging problems. Empathy is the central feature of human-centered design thinking because it focuses on the user's thoughts and feelings, and contributes to shared understandings and solutions. This presentation examines the experiences of fourteen pre-service teacher education and human services professionals while developing product prototypes in a design thinking course. Analysis of final products, along with preliminary analyses of survey and interview data, highlight affordances and barriers to prototype completion while participants designed games, learning materials and devices with and for children, youth, communities and families based on empathy and human-centered design principles. Global design company, IDEO, has developed an extensive set of resources to support teachers as they work in schools to solve design challenges. Yet, few researchers have examined how the process of design thinking plays out in pre-service education or professional practice. Findings offer suggestions for the re-vision of pre-professional education in ways that incorporate design thinking.

**Keywords:** *Design Thinking, Pedagogy, Creativity, Teacher Education.*

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## 1. Introduction

The importance of improvisation and creativity has long been deemed valuable in pre-service education and professional practice (Darling, Erickson & Clarke, 2007; Hanley & Fenton, 2007; Steitzer, 2011). However, it is only recently that design practice has been considered within teaching and human services professions. Some conceptual work, for example, has described how teaching involves “design work” (Jordan, 2016; Kirschner, 2015). Jordan (2016) suggests that pre-service teachers need to develop habits of thinking and problem solving that allow for flexibility and alternative solutions. Yet pre-service education is rarely approached as design work since teachers have traditionally been expected to implement the knowledge created by others rather than design their own solutions. Additionally, as Retna (2013, p. 5) notes, “There is a lack of empirical research on the adoption and implementation of the design thinking process in educational contexts from the teachers’ point of view.” While conversations are just beginning within teacher education, they are not yet part of the lexicon in the human services professions.

What happens when pre-service teachers and human services professionals engage with one another in design thinking while creating solutions with and for students, classrooms, families and communities? This pilot project examines the design process through five stages:

- *Empathize*: Observe, engage, watch and listen to children, teacher, etc... who are expressing a need
- *Define*: Bring clarity to what was learned through empathy, arriving at a point of view (project scope)
- *Ideate*: Begin creating solutions through brainstorming
- *Prototype*: Generate artifacts that move closer to a final solution
- *Test*: Test the prototypes by obtaining feedback from users (*iterate*: by using feedback for revisions)

Over the course of an academic term (10 weeks) this research takes a qualitative approach to examining how students move through the design process, how they engage in empathic design, and how they view the value of this work from inception through to completion.

## 2. Sample and Method

Fourteen students enrolled in a quarter-long (10-week) experimental course on “creative change” participated in this research. Twelve of the participants were female and all were enrolled in pre-professional programs with the goal of becoming k-12 teachers or human services professionals. The age of respondents ranged from 20 to 31 years, with an average of 23.7 years. All of the students were taught and practiced steps in the design thinking process including empathizing, defining, ideation, prototyping and testing their designs. However, no constraints were placed on the type of product to be produced.

This pilot project was conducted as a qualitative inquiry using an open-ended online survey response method and semi-structured interviews. All participants gave permission for their responses and designed projects to be shared for the purpose of future course development and research/dissemination. Survey data (collected mid-quarter) and interview questions (taking place after the end of the quarter) focused on the following:

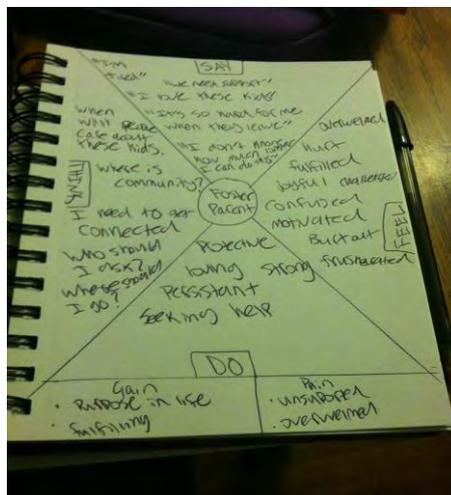
- a. How participants arrived at a project idea and how the project evolved over the course of the quarter.
- b. What factors or processes helped as participants completed the project? What kinds of roadblocks and/or barriers were experienced that stalled progress? How did they overcome these barriers?
- c. How participants moved through the tedious and boring elements of working on the design project.
- d. What would they might do differently if they were to complete an open-ended design project like this again in the future.
- e. Description of future plans for the project (if any) and what help is required to bring their design to scale.
- f. How learning from this design project might transfer to personal and/or professional life.

## 3. Results and Case Example

All of the participants successfully completed the design process, from original activities associated with client empathy through to developing a product prototype. Due to time constraints prototypes were not able to be tested and refined, though three of the participants continued to develop and use their products after the course concluded.

Projects varied from products such as the design of a prototype vending machine for homeless people to games to teach about substance abuse and the apartment rental process, to a game to support creative writing and another to help students handle failure in a positive way. Other participants designed services such as “Dive and Drive” to pick-up and re-distribute clothing and an interactive website to help convicted felons gain employment after being released from prison. All of the participants initially met with children, families, and other community members to understand their needs and to learn about the types of products and services that would be useful. They then created empathy maps (Figure 1) and determined the scope of their projects before designing their prototype. Using sketch books participants shared their progress each week with each other and received feedback.

Figure 1. Empathy Map: What Users Think, Feel, Say and Do.





## HOW STUDENT LEARN GEOGRAPHY INDOOR AND OUTDOOR – COMPARISON OF LEARNING SKILLS AND PHYSICAL ACTIVITY

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### Abstract

Fieldwork is a form which has been considered for many years to be a strong instructional strategy for understanding today's world. It is specific for a variety of sciences and indispensable for geographical education. Fieldwork is very specific and its contribution is not only in the cognitive area, but it is important for the affective side of education as well as supporting mutual communication and interpersonal relationships. Positive effect of the fieldwork is also in development students' motor skills. As is evident, fieldwork should have its place firmly anchored in the current school curriculum. However, despite its indispensability, it still fails to be implemented in teaching at all levels and types of schools in the Czech Republic.

The aim of the poster is compare the success rate of the solution of geographical tasks in the classroom and in the field and measure the physical activity of students during these activities. Tasks for testing are designed so that they can be implemented both in the normal classroom and in the field. Whether pupils solve the same task more successfully in the classroom without the influence of the environment or in the field – in an environment where the specified job is realistically happening and where the learner can engage visual and auditory sensations will be monitored. During testing, measuring of the physical activity of students is also be carried out – the students receive an ActiGraph device, which will measure their activity during a day spent at school indoor or outdoor.

**Keywords:** *Field work, geography, Czech Republic, physical activity, ActiGraph.*

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### 1. Introduction

The benefit of outdoor learning (or fieldwork) is not only in educational dimension. The other important benefit, which can work in field offer to pupils, is an additional physical activity. Nowadays, many researches indicate (HBSC, 2012), that population is more unhealth in relation to diseases caused by the lack of natural physical activity (exercise, walking, running etc.). We want to point out this benefit of outdoor learning, because healthy lifestyle is essential for children in school age. In our research, we want to measure physical activity of pupils in the classroom and in the field (outdoor). The educational task remains the same (theme of the educational unit) in both cases, but the environment and educational methods are different. In classroom pupils are taught in classic way (frontal education, work in group), in field they have to use techniques enquiry-based education.

### 2. Objectives

The objective of this measuring is to compare the success rate of the solution of geographical tasks in the classroom and in the field and measure the physical activity of students during these activities. After evaluation and possible revision of the pilot testing and measurement, testing and measurement is performed in its entirety. Selected members of the research team will be in close contact with the monitored class of the given school. Testing in about 2–3 schools in South Moravian Region is envisaged.

### 3. Methods

The data for measuring physical activity are collected by activity monitor ActiGraph wGT3X-BT. This device consists of two body parts (chest strap and the 3-axis accelerometer) and specific licensed software. Chest strap is a standard device for measuring the heart rate and subject have to wear it on the bare skin. The 3-axis accelerometer is allocated on subject hip (left or right, depends on subject's dominant hand). This device is appropriate for measuring in the field, because it is possible to set it up by the smartphone. The device measure for example: date, time, heart rate, steps, kcals, fluctuations movement in 3 axis (x, y, z) and MET rate. Students have to pass a special filed track, with several geographical problem tasks. They need to deal with this tasks to complete the testing.

On September 14<sup>th</sup> (2016) the first pilot measurement took place in IPWF<sup>1</sup> Jedovnice (Moravian karst, Czech Republic). The sample for measuring consisted of five (3 female and 2 male) students of Master's degree programme (Teachers training for geography and P. E.) The time of measuring was set from 9:05:00 (CEST) to 12:59:50 (CEST).

The second measuring was held on November 5<sup>th</sup> (2016) at the same place (IPWF). Sample consisted of six male pupils of Grammar school in Žďár nad Sázavou (Vysočina region, Czech Republic) and the data were collected from 10:00:00 (CEST) to 12:24:00 (CEST). In both cases the track that students have to pass was about 4 kilometres long and the activity monitor was recording the data in 10 seconds' interval. On the track, there were prepared six hidden caches, which students have to find (using the GPS device GARMIN Dakota 20 and given coordinates) and deal with the problem task inside the box. The time required to complete task per student is observed as well as other characteristics from activity monitor mentioned above.

### 4. Conclusions

Both the pilot measurement help us to reveal some weaknesses of work with activity monitors ActiGraph wGT3X-BT:

ActiGraph wGT3X-BT was not recording sometimes (some intervals are missing), the reason of this problem is not obvious. It is possible that the chest strap can be distanced from skin from time to time and that is the one of possible reasons of non-recording.

Data from long-time measuring (several hours) recorded in short time intervals (10 s) are difficult to evaluate.

For the valid data collecting is necessary to know following personal characteristics of tested subject: sex, age, height, weight. It is also good to know if subject is active in some kind of sport or is used to high physical load or has same closer relation to geography and geographical tasks.

Recommendation are following: for measuring choose shorter educational unit (about 1 hour), fix the problems connected with non-recorded data, observe the time pupils spend on particular tasks for further comparison. Final results of the measurement will be presented in the poster.

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<sup>1</sup>IPWF – Integrated professional Workplace for Fieldwork, special field station of Department of Geography, Faculty of Education, Masaryk University, Brno, Czech Republic

## INNOVATION FOR MATHEMATICS EDUCATION IN ARCHITECTURE

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### Abstract

This work presents a teaching innovation of Mathematics within the University Degree in Architecture. More specifically, the proposal consists of a combination of History and Mathematics and uses as an example the building of the School of Architecture at the University of Granada (Spain), which received the National Architecture Award in 2015.

In order to familiarize students with the complex mathematical and architectural processes that underlie such a great construction, this work applies the theory of graphs to analyze the critical points that a work can present in its functional-circulatory system, as well as in its visual connections, acoustics or adjacency. With the use of this analysis system, students are provided with a very useful tool that can avoid undesirable situations in the first instances of the project due to the lack of clarifying systematization in the design process.

An innovative aspect of this work is that it adopts an inverse process, analyzing an existing work (something that captures the students' interest) and then analyzing it through the application of graph theory and the analysis of the proportions used. In the design of the same, the importance of these mathematical tools in the design instance.

**Keywords:** Higher education, innovation, mathematical tools, Architecture, Graphs of chords.

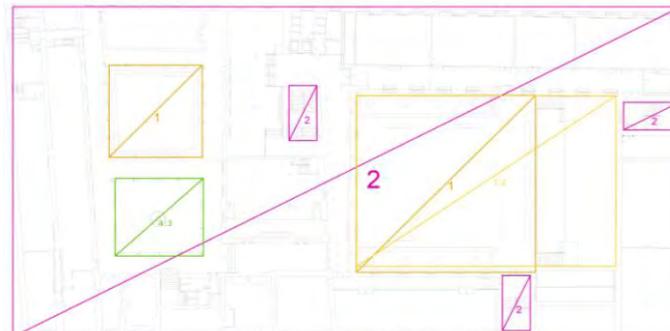
### 1. Analysis of the proportions used in the construction of the building of the School of Architecture of the University of Granada (ETSAUgr)

On May 26, 2015, the new headquarters of the ETSAUgr were inaugurated, rehabilitated by the architect D. Víctor López Cotelo, who has adapted the old building of the Military Hospital to its university function from a constructive simplicity. He uses, for communication, its zaguanes, patios, galleries, corridors and stairs that are related. All this will be the object of our study.

The proportions or numerical relationships have been applied in architecture since antiquity to find patterns that allow people order the constructions, from the simplest to the most complex (Spinadel and Nottoli, 2008). All have been used to give an order to the buildings to be built, whether aesthetic, constructive, structural, etc. (Ugarte and Azabache, 2011). Numerical relations constructions are a way of ordering spatial architecture from simple mathematical equations (Calcerrada, 2013).

Proportions of static type, 1, 2, 8:9, 4:3; 3:2; 4:11 y 31:10 have been used in the construction of the ETSAUgr building, and of dynamic type: Cordovan, golden,  $\sqrt{2}$ ;  $\sqrt{3}$ ;  $\sqrt{5}$  and  $\sqrt{6}$ , have been studied in all dependencies of the building, as shown in (Figure 1).

Figure 1. Proportions of the plant of the School of Architecture 2015.



The theory of graphs is a very useful mathematical tool to analyze the connectivity between stays of a design, through incidence matrices and graphs associated with them, since it allows explicit visualization of spatial relationships (Earl and March, 1979). These connections can be of physical, visual, acoustic or adjacency communication since the architectural design process poses several problems to solve: spatial relationships, circulations, route directionality, functionality, aesthetics, interconnections and other variables that transform it into a highly complex process (Steadman, 1976).

When analyzing a work of architecture, through the theory of graphs, we clarify the advantages, critical points and disadvantages that the same can present in relation to its functional-circulatory system. Analogously, visual, acoustic or adjacency connections can be analyzed.

By means of this method of analysis, in the first contact with the project, undesired situations could be avoided, due to the lack of a clear system in the design process, which becomes more necessary, the higher the complexity of the building being developed.

In this work, although we have done the graph of each of the plants and the associated incidence matrix in a building as complex as the ETSAUGr, due to the differences in height between the slabs or the number of pavilions that form it, we have found that there are many spaces of passage that exist, numerous corridors and stairs that we must pass to reach the destination. As an example, Figures (Figures 2 and 3) show the communications graph and incident

Figure 2. Graph of communications in the plant semibasement on plant.

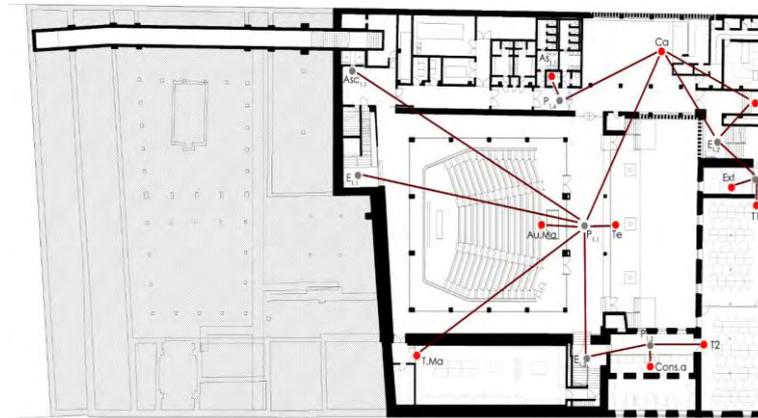


Figure 3. Matrix of the grafo of communications in the plant semibasement.

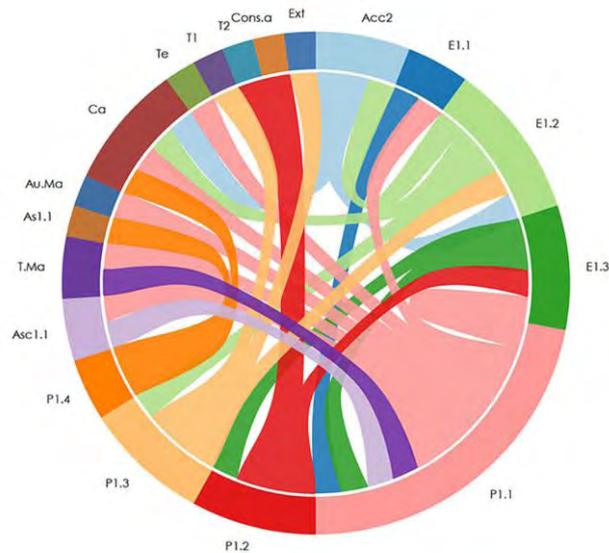
|        | Acc2 | E1.1 | E1.2 | E1.3 | P1.1 | P1.2 | P1.3 | P1.4 | Asc1.1 | T.Ma | As1.1 | Au.Ma | Ca | Te | T1 | T2 | Cons.a | Ext |
|--------|------|------|------|------|------|------|------|------|--------|------|-------|-------|----|----|----|----|--------|-----|
| Acc2   | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| E1.1   | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| E1.2   | 1    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0      | 0    | 0     | 0     | 1  | 0  | 0  | 0  | 0      | 0   |
| E1.3   | 0    | 0    | 0    | 0    | 1    | 1    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| P1.1   | 0    | 1    | 0    | 1    | 0    | 0    | 0    | 0    | 1      | 1    | 0     | 1     | 1  | 1  | 0  | 0  | 0      | 0   |
| P1.2   | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 1  | 1      | 0   |
| P1.3   | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 1  | 0  | 0      | 1   |
| P1.4   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0      | 0    | 1     | 0     | 1  | 0  | 0  | 0  | 0      | 0   |
| Asc1.1 | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| T.Ma   | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| As1.1  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| Au.Ma  | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| Ca     | 1    | 0    | 1    | 0    | 1    | 0    | 0    | 1    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| Te     | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| T1     | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| T2     | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| Cons.a | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |
| Ext    | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0      | 0    | 0     | 0     | 0  | 0  | 0  | 0  | 0      | 0   |

## 2. Graph of chords

It is a tool that allows us, at the time of the architectural design of a building, to analyze the relationships between the spaces and the concepts of circulations (Figure 4).

In this graph we can see the inputs and outputs to all dependencies of a plant, we can also select one of the spaces and check their direct relationships (Frankens Team, 2012). We can also distinguish between zones of passage or end zones according to whether they have round trip or single route.

Figure 4. Graph of chords of the plant semibasement.



### 3. Conclusions

After analyzing the use of proportions and static and dynamic measures in the design and construction of the building that houses the ETSAUgr, as well as the interrelations between the different habitats and plants that make up this building, we can draw the following conclusions:

- The study of the proportions used in the design of the building has allowed us a deeper understanding of the grandeur of the building and the rigorous use of the measurements in the different rooms and ornaments present in it.
- The use of graph theory has facilitated us to decipher the degree of interrelation between dwellings and others in the building.
- Through the chord diagrams we have analyzed, among other data, the ease of transfer between the different rooms as well as the calculation of the optimal routes between the spaces that make up the building.

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## THE CONTEXT OF USING INDIVIDUALIZED DIDACTIC STRATEGIES AND METHODS IN SANITARY POST HIGH SCHOOL TO ACHIEVE PROFESSIONAL COMPETENCIES

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### Abstract

Nursing teacher's educational responsibility has an important role in training the next nurses and Nursing, as a discipline has a major importance in the curriculum. Actively involved in the health education of the individuals and the community, nurses carry on an activity which implies gaining knowledge, attitudes and skills. The purpose of this research is to find out the students' average degree of mistrust in themselves or in others, the degree of critical or self-critical vision in order to obtain the proper skills for nursing occupation. We also researched the possibilities of students' personal development in gaining the ability to adapt to a proper learning environment. In order to verify the assumptions made, we used in this survey the questionnaire “Self-Others” as a research method. The research sample accounted for 100 students aged between 20-50 years, part of the 1st year study group with “Nursing for general care” specialization from “Fundeni” Sanitary Post High School, Bucharest, Romania. For a part of this survey we used Microsoft EXCEL 2007 and for the other part (CHI test Square and charts) using SPSS15. The analysis of the provided data regarding the students' gaining professional skills by the graduation of their three-years course led us to the conclusion that in the instructive-educational process, the Nursing teacher had to use customized methods and didactic strategies taking into account every student's psycho-pedagogical profile, so that all the students, irrespective of their age, intellectual, social and cultural development were able to obtain the skills and abilities required for a nurse occupation.

**Keywords:** *Nursing, specific competencies, individualized didactic strategy.*

### 1. Introduction

Nursing is a professional activity relying on a system of knowledge found in curricula and having four major objectives which turn into the profession responsibilities; health promotion, illness prevention, health recovery and pain removal [1]. In view of getting the professional competences of the future medical nurse, we should investigate the personal development opportunities of the pupils and their adjustment capacity to a specific learning context. The nursing teacher has an important role in the instructive-educational process by the use of methods and didactic strategies tailored to the pupil's requirements, observing his/her individuality, and also keeping unchanged the main object which is “the gain by all pupils of knowledge, abilities and attitudes” required for a future medical nurse.

### 2. Objectives

In view of increasing the efficiency and effectiveness of medical services, as nursing teachers, we intend that by the end of the three years of study, to use in the instructive-educational process various methods and personalized didactic strategies. We considered the age difference, intellectual, social and cultural development of the students and their psycho-pedagogic file so that all students are capable to acquire the skills and abilities required by the profession of medical nurse. In order to increase the adjustment capacity to a specific learning context, we intend to investigate the personal development possibilities of the students, conducting a survey which reveals the average rate of students' ‘mistrust in themselves or in others, the critical or self-critical level in view of gaining the specific competences for the profession of medical nurse. Within the study we assumed the following: the older the students, the less interested they are to change their behavior or their living style; if their mistrust level in themselves or in others is higher, modesty also falls on the way the students get older and gain experience and then the person is subject to school abandon and lack of interest for the profession; the lower the critical or self-critical spirit, the deeper the fall of their adjustment capacity to a certain specific learning context.

### 3. Materials and method

The research design is of descriptive, observational type and we used as data collection method the inquiry based on questionnaire with a quantitative data analysis method. The research method was selected depending on the characteristics of the studies process and the existence of adequate investigation instruments. To see more accurately if the set up assumptions are valid, we used as investigation method, the Questionnaire “Self-Others” aimed at highlighting the aspects leading to the diagnosis of some stronger personality structures. The research sample accounted 100 students aged between 20-50 years, part of the 1<sup>st</sup> study year group with “Nursing For General Care” specialization from “Fundeni” Sanitary Post High School, Bucharest, Romania. On the 100 students sample we applied the Questionnaire “Self-Others”, which included questions about age, sex, domicile (life environment) and a set of 50 self-assessment questions of the person and of the relations with other persons. Each question had five possible answers, of which only one was chosen: A – Not true; B – A little true; C – Half true; D – Most of the times true; E – True. The subjects participating in this study can be regarded as normal regarding their intelligence and personality, meaning they do not show any serious emotional, behavioral disorders or difficulties in adapting to reality. The questionnaires were distributed and collected in the course room. A part of the analysis and charts was performed using Microsoft EXCEL 2007 and the other part (CHI test Square and charts) using SPSS15.

### 4. Results

The analysis of quantitative study showed the students’ perception regarding inter-personal relations, as well as their personal self-assessment. Table 1 compares the number of respondent students to their age, sex and domicile. Most respondents were between 20-29 years old (55%), followed by those between 30-39 years old (23%). Number of girls is 4.55 higher than that of the boys. The number of students from urban environment is twice as large as that of those from rural areas.

Table 1. Number of respondent students depending on age, sex and domicile.

| Age          | Number     | Percentage    |
|--------------|------------|---------------|
| < 20 years   | 14         | 14.0%         |
| 20-29 years  | 55         | 55.0%         |
| 30-39 years  | 23         | 23.0%         |
| ≥ 40 years   | 8          | 8.0%          |
| <b>Total</b> | <b>100</b> | <b>100.0%</b> |

| Sex          | Number     | Percentage    |
|--------------|------------|---------------|
| <b>Girls</b> | 82         | 82.0%         |
| <b>Boys</b>  | 18         | 18.0%         |
| <b>Total</b> | <b>100</b> | <b>100.0%</b> |

| Domicile     | Number     | Percentage  |
|--------------|------------|-------------|
| <b>Urban</b> | 67         | 67%         |
| <b>Rural</b> | 33         | 33%         |
| <b>Total</b> | <b>100</b> | <b>100%</b> |

We analyzed in turns the answers to all the 50 questions and each questions in the light of the three factors, which could have influenced the answers. We applied a statistic test (Chi square) to see if there were statistically significant differences. The analysis highlighted that the elder students (over 30) are more understanding than the younger ones and consider other’s feelings when they have to meet a goal, while those of 20-29 years old, are more inclined to disconsider the other’s feelings when they have to meet a goal. On the way they get older, the respondents are no longer interested to change their life in view of avoiding failure. Modesty drops on the way the students get older, gain experience and can correctly value themselves.

The data analysis revealed there were ten questions influenced by sex, the differences between the number of cases in the two age groups being significant statistically. The sec influence for these questions is of 31-39%, consequently, rather high.

Following the analysis, it resulted that the girls have more difficulties in overcoming a failure, while the boys do not afford to dispute another’s opinion when it is certain to be the right one. 22% of the girls declared they panicked if they thought of what they did wrong or that they might mistake in the future, while the boys’ percentage was of 16.7%.

As regards the living environment, the data analysis has shown there are six influenced questions, and the differences between the number of cases in the two life environments being statistically significant. The influence of the life environment for these questions is of 42-45%, consequently, rather large influences. For the other questions, even if there are no statistically significant differences, the calculated influences are between 20-39%. The respondents from both life environments answered differently. The perceptions are different in the two life environments.

We centralized the table results to get an overview of the three factors influence over the questionnaire questions and their analysis highlighted a few observations: sex has the highest influence, followed by age and finally by the life environment.

## 5. Discussion

Certain studies focus on the development of the student's clinical reasoning, a skill every medical nurse needs, but during the instructive-educational process, the nursing teacher is confronted with the way in which to present it to the students and how to assess it [2]. The nursing teacher should consider a multitude of factors when choosing the best didactic strategies, having in view the specific learning context. Medical literature suggests that use of simulation and practice with feedback facilitates clinical learning [3]. The use of realistic simulation in training medical nurses and helping them to get clinical skills and competences is ever more efficient and a useful training technique, allowing the students with a minimum of technique and non-technical skills to gain them before using them in clinical training stages [4]. It can be beneficial for the students, if adequately used and to improve teaching and learning quality. Training programs by simulation improve communication skills and increase motivation level during students' development [3]. Learning by simulation also has some advantages, such as: capacity to experiment in a crisis before it actually occurs; the capacity to assess and reflect on the activities in a space, which is not dangerous; and predictability to be able to artificially create situations, which might occur in any other way [5]. Self-directed learning is a training method ever more used in adults' education as we need a valid and trustful instrument to measure self-directed learning willingness [6]. Competition between the schools of medical nurses training made us consider and apply new learning strategies for a better training of the future medical nurses, preparing them to play ever more complex roles, requiring a higher level of critical thinking and abilities of clinical reasoning [7].

## 6. Conclusions

According to the results, our study identified the following:

- a) The older the students get, the less interested they are to change their behavior and living style to avoid failure.
- b) The lack of self-confidence or in others is higher and modesty falls on the way the students get older and gain more experience.
- c) The lower the critical or self-critical spirit, the lower their adjustment capacity to a specific learning context.

In this context, we regarded necessary to implement personalized didactic strategies, focused on the student, by designing varied learning activities, considering the individual learning styles of each student, helping him to improve his abilities of critical thinking, to understand their strengths and weaknesses. In this sense, for instructive-educational processes, we promoted learning experiences by most varied contents and activities, supporting the development of each student's potential, we draw up the student individual sheet and used different didactic methods and strategies.

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## **EFL STUDENTS' PERCEPTIONS OF THE EFFECTIVENESS AND ENJOYMENT OF TEACHING METHODS AND LEARNING ACTIVITIES**

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### **Abstract**

English language, as a worldwide communication device, is learned for different purposes in formal and informal environments. These purposes vary from compulsory English education at schools, preparation for standardized proficiency tests, studying/ working abroad, doing research to quite specific ones like socializing or using technology efficiently. Regarding this fact, English teachers and instructors have to choose the most effective way of teaching English to the target group based on their special needs. However, no matter what the purpose, the learner or the context is, they are always supposed to help students get motivated to learn and the first step is giving them effective and enjoyable ways to learn and activities to deal with. That is why, it is necessary to examine how effective and enjoyable target learners find the methods and activities, which are used in class.

On this ground, this research tries to find out preparation school students' perceptions of the effectiveness and enjoyment of teaching methods and learning activities at the School of Foreign Languages of Anadolu University in Turkey. The participants are 50 Turkish students from pre-intermediate level. The data was collected with a questionnaire taken from Seo's thesis research (2011)<sup>1</sup> and analyzed using descriptive statistics. The results show learners' perceptions of currently-used teaching methods and learning activities and give teachers the chance to improve their practices accordingly.

**Keywords:** *EFL students, students' perceptions, motivation, teaching methods, activities.*

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<sup>1</sup> Seo, Y. E. (2011). English Language Learners' Motivation and Their Perceptions of the Effectiveness and Enjoyment of Teaching Methods and Learning Activities. Advisor: Dr. Mohammed Darabie.

## EVIDENCE-CENTERED DESIGN FOR COGNITIVE DIAGNOSTIC ASSESSMENT IN LEARNING MATHEMATICS

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### Abstract

This study aims to use the evidence-centered design to practically help teachers to design cognitive diagnostic assessments in mathematics and to investigate the performance of cognitive diagnostic tests. The empirical data used in this study were responses of 593 grade four students from Taiwanese elementary schools. The fraction unit was used as an example. The Cronbach's Alpha of the assessment is 0.88. Using the experts' decision as a golden criteria, the consistency rate between experts' decision and the cognitive diagnostic model in predicting mastery eight skills or not each student is 94% in average. The performance of the cognitive diagnostic assessment designed in this study was well, which can be a good practical example.

**Keywords:** *Cognitive diagnosis model, ECD, elementary, mathematics, fraction.*

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### 1. Introduction

Evidence-centered assessment design (ECD) provides a systematical assessment design framework (Mislevy, Steinberg, & Almond, 2003; Zieky, 2014) to help teacher to systematically design assessment and to efficiently do assessment activities. The ECD is the basis of the assessment development of many multiple assessments and practice assignments. In recent years, the ECD is applied in many different assessments such as game-based assessment (Almond, 2015; Jaffal & Wloka, 2015; Kim, Almond, & Shute, 2016), stealth assessment (Wang, Shute, & Moore, 2015), and diagnostic assessment (de la Torre & Minchen, 2014); and also applied in assessments of different domains such as the assessments of mathematics (de la Torre & Minchen, 2014) and science domains (Towns, Harwood, Robertshaw, Fish, & O'Shea, 2015). If teachers have a specific referable assessment design framework to be referred when they are in designing assessments, assessment results can be efficiently responded to assessment goals and further give feedback to teaching activities. The ECD provides a good assessment design framework that can help teachers to achieve assessment goals.

The measurement models used in cognitively diagnostic assessments (CDAs) are cognitive diagnosis models (CDMs). The CDMs provide more effective ways to help teachers to quickly obtain detailed information about students' strengths and weaknesses in learning, such diagnostic information is useful for implementing remedial instructions by teachers and can improve students' learning performance (de la Torre & Minchen, 2014). At present, many CDMs have been developed and applied, such as the deterministic input, noisy "and" gate (DINA) model (Junker & Sijstma, 2001) and the generalized DINA model (de la Torre, 2011). This study is to introduce the DINA model, which is the simplest model of CDMs, to facilitate teachers to learn to use. A fractions unit of math subject for elementary fourth-grade students was taken as an example to show how to use the ECD to design the assessment activity with the DINA model as the measurement model, to report the assessment results to students and teachers, and to help teachers to more effectively obtain diagnostic information about students' learning states for achieving diagnosis purposes.

### 2. Evidence-Centered Assessment Design (ECD)

The ECD architecture contains two parts: conceptual assessment framework (CAF) and four-process architecture, which investigate the design and delivery processes for assessments. The first part CAF contains five models that are student model, evidence model, task model, assembly model, and

presentation model. The second part four-process architecture contains four processes that are presentation process, response processing, summary scoring process, and activity selection process (Mislevy, et.al., 2003)

**3. DINA model**

The DINA model is the most commonly used model of CDMs (de la Torre, 2008). This model uses two parameters to interpret students’ slipping and guessing behaviors in responding items. Hence the probability of correctly answering an item in the DINA model is defined as  $P(X_{ij} = 1 | \alpha_i) = (1 - s_j)^{\eta_{ij}} g_j^{(1-\eta_{ij})}$ , where  $X_{ij}$  is the response of item j by student i;  $\alpha_i$  is the skill pattern;  $\eta_{ij}$  is the ideal response, and the formula of  $\eta_{ij}$  is defined as  $\eta_{ij} = \prod_{k=1}^K \alpha_{ik}^{q_{jk}}$ , where  $\eta_{ij} = 1$  indicates that  $\alpha_i$  possesses all measured skills of item j;  $\eta_{ij} = 0$  indicates that  $\alpha_i$  lacks at least one of the measured skills of item j;  $s_j$  is the slipping parameter of item j;  $g_j$  is the guessing parameter of item j.

**4. Method**

**4.1 Participants**

In this study, purposive sampling was adopted and the schedule for collecting samples had to match teachers’ progress. That is, the students of each class, who had learned the fractions unit in the first semester of the fourth grade, had to finish the test within a month. The empirical data were responses of 593 fourth grade students selected from 25 classes in 17 Taiwanese primary schools.

**4.2 Procedure**

The procedure of our assessment contains six steps. The first step is that defining the eight skills to be measured for the test in the student model. The second step is that constructing items to build the item bank in the task model. The third step is that selecting items from the item bank to assemble the test in the assembly model and, meanwhile, to valid the Q-matrix for the assembled test. Because the Q-matrix can affect the inference for whether students have skills or not and also can link tasks and skills. Consequently, Q-Matrix validation will associate the student model with the task model. The fourth step is that administering the assembled test by paper and pencil way in the presentation model. The fifth step is that estimating the skills by the DINA model using the students’ responses and the Q-matrix for the test in the evidence model. Finally, the sixth step is that summarizing the estimated results for the learning concepts as a diagnostic report as the basis for teachers' remedial instructions.

It is noted that the delivery processes of our assessment are: (1) assembling the formal test and then administering that (this is the presentation process), (2) collecting students’ responses and then scoring (this is the response processing), and (3) inputting the scored responses and the Q-matrix into the DINA model and then estimating the measured concepts (this is the summary scoring process). The estimated results contain item slip and guessing parameters, the proportion of students who are master per skills, and the diagnostic report which presents that each student whether or not master each learning concept.

**5.bResult**

Because determining whether students have the skills by experts is manpower-and-funds-consuming, in practice, we can use CDMs with computer operation to infer students’ mastery status of skills through their responses and Q-matrices for tests. In this study, the results showed that the DINA model can precisely diagnose the distribution of students’ skills, which had good agreements with expert results. The results is shown in Table 1. The developed diagnostic test in this study has good validity.

*Table 1.* Consistency rates between DINA model and decision of experts for skills.

| K1   | K2   | K3   | K4   | K5   | K6   | K7   | K8   |
|------|------|------|------|------|------|------|------|
| 0.91 | 0.92 | 0.93 | 0.99 | 0.95 | 0.94 | 0.97 | 0.92 |

## 6. Conclusion

In this study, the designed cognitively diagnostic assessment based on the ECD had good reliability and validity. The detailed diagnosis results provided by the designed assessment can help the student to understand the distribution of his/her learning concepts, and can help teachers to understand the distribution of learning concepts of the students in a class. These diagnostic information can also be a basis for planning students' learning.

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# THE EFFECTS OF PROBLEM BASED LEARNING IN CHEMISTRY EDUCATION ON MIDDLE SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT AND ATTITUDE

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## Abstract

The objective of this study was to determine the effects of problem-based learning (PBL) on student performance and attitude toward chemistry. In the study, data was obtained through the use of pre-test post-test, research-control group model. The data obtained from both groups was analyzed using t-test scores, mean, and standard deviation. The study was conducted on a sample of 120 7th grade students, in a French-speaking private school in Lebanon. Two types of instruments were used for measurement: achievement tests and an attitude questionnaire. The research group was taught chemistry using PBL while conventional teaching methods were applied in the control group. Results indicated that implementing problem based learning approach had improved students' achievement and attitude. This study encouraged teachers to implement problem based learning method teaching science concepts especially chemistry for middle school students.

**Keywords:** PBL, science education, Lebanon, achievement, attitude.

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## 1. Introduction

Too often, science instruction is divorced from students' interests and daily living (Aikenhead, 2006; Koller, Baumert, & Schnabel, 2001). Conventional teaching strategies are teacher-centered, where students passively receive information and gradually become aversive to science and, in turn, exhibit lower performance as they move up grades (Butler & Nesbit, 2008).

The picture is even gloomier in the Arab World. An analysis of the science curricula of Arab countries revealed an overemphasis on the theoretical aspects at the detriment of direct applications of science in novel or everyday situations, and failure to adequately develop students' investigative problem-solving and thinking skills (BouJaoude, 2002). To address this need, problem-based learning (PBL) was advocated as an innovative curricular approach that deviates from traditional strategies by moving from a teacher-centered model to a more active student-centered learning environment where students are active independent learners (Akmoglu & Tandogan, 2007).

Stepien, Gallagher, and Workman (1993) provided the following definition:

Problem-based learning is apprenticeship for real-life problem solving...students find a situation with undefined problems, incomplete information, and unasked questions. The scenarios presented to the students demand problem solving the way we find it in life: defining and detailing issues, creating hypotheses, searching for and then scanning data, refining hypotheses with the help of the collected data, conducting empirical experiments or other research, developing solutions that fit the conditions of the problem and evaluating and/or justifying their solutions so there is reason to expect conditions will improve (p. 342).

## 2. Attitudes towards science and PBL

Attitudes can be defined as general and enduring positive and negative feelings (Cherry & Mattiuzzi, 2010) and are regarded as outcomes which can be acquired over the process of learning. Research has demonstrated that attitudes toward science change based on exposure to science, but that the direction of change may be related to the quality of that exposure (Gogolin & Swartz, 1992). Accordingly, the best way for students to learn science is to experience challenging problems and the thoughts and actions associated with solving them (Greenwald, 2000). PBL purports to increase motivation for learning by open-ended discussions and effective collaboration (Schmidt, Muijtjens & Norman, 2012), thus leading to improved achievement and attitude.

## 3. Research questions

The empirical investigation at hand targets the differential effect of PBL on performance on high cognitive level items as well as on students' attitude toward this technique. It is an unprecedented

research effort in Lebanon especially targeting the association between the development of constructivist classrooms and changes in students' attitudes. Specifically the study addressed the following questions:

- Is there a significant difference in the performance of students trained in the use of PBL in science relative to their peers who are taught using the traditional technique?
- Do students trained in PBL score higher on higher cognitive items than controls?
- Do PBL-trained students have a more positive attitude towards science than the non-PBL group?

## 4. Method

### 4.1. Participants

This study was conducted in a private school located 50 km south of Beirut, on a group of seventh grade students aged between 12 and 13 years old, attending the French section, where science is taught in French, among other subjects. A total of 120 students participated in the study. The students were exposed to the same curriculum. They were divided into two equivalent groups: an experimental group that consisted of 60 students (33 males and 27 females), and a control group of 60 (31 males and 29 females). Students were kept in their original sections. The school assigns the students of the same grade level into homogeneous sections regarding gender, class average, highest and lowest grades to ensure a normal distribution in each class.

### 4.2. Design

This research has experimental design with a control group, pretest and post test design. The PBL approach was applied on the experimental group to teach the unit of separation techniques, while the students in the control group were instructed in the same content of the unit using conventional teaching strategies. Before starting the lesson, information on the problem-based learning model had been presented to the experimental group. The PBL lessons took place over a period of 3 weeks through 50 minute sessions held twice a week.

### 4.3. Instruments

To assess the effects of PBL, two instruments were used: an achievement pre and post test on "Mixtures and Separation Techniques" in chemistry and an attitude questionnaire. Content validity was established by 3 chemistry school teachers (2 for middle and one for secondary classes) and one university instructor. Reliability constant (KR-20) of the test and discrimination indices of each item were computed. The items which have item discrimination index under 0.30 were eliminated from the test.

A high reliability attitude questionnaire adapted from Siegel and Ramney (2003) was to measure perceptions and attitudes towards the PBL method of instruction in chemistry. It consisted of 16 items on a 5-point Likert scale.

### 4.4. Data collection

The PBL cycle was a real like problem presented to students. The unit separation mixtures started with daily life application of mixtures. Students in the PBL class were divided into groups of 4 according to their performance levels and learning styles. Their tasks consisted of suggesting and performing an experimental procedure to purify water with the minimum losses, formulating hypotheses through group discussions on the expected type of pollutants, an individual home-based reflection involving self-directed learning followed by a presentation to the group concerning the preferred hypothesis. The final step was to conduct group research and systematically reporting results.

A teacher-led lesson was carried out on the challenging subject of fractional distillation, then students were asked if they wanted to change anything in their procedures. Students were asked to perform the separation techniques to check the validity of their hypotheses, then were asked to complete the table they started first for polluted water so as to compare the results and verify the efficiency of their technique; this was perceived as reflection on the knowledge acquired. Afterwards, students were asked to search for information about separation techniques used in purification plants using certain assigned resources then compare it with the separation techniques they used to assess their efficiency and applicability. At the end, students were asked to write a brief reflection essay about the whole process.

## 5. Results

### 5.1. Student Achievement

The means and t-values were calculated to determine the significance using SPSS v.13.0. Significance was computed at  $p < .05$ . Results showed the following:

- Control and experimental groups had similar prior knowledge, thereby confirming the proper choice of the samples and increasing reliability (T tests ranged between 0.35 and 0.47).

- Achievement of experimental group on the post-test was significantly better than that of controls. Given no other interfering variables, this finding is in favour of the PBL intervention, consistent with earlier findings (for example, Hattingh and Killen, 2003) that the use of PBL is more effective in learning science than traditional methods which do not seem to develop higher-order thinking skills (Yu, She & Lee, 2010). T tests were all 0.00

- A significant difference was found between pre and post test results for the experimental group before and after applying PBL across all thinking skills (T tests were all 0.00).

## 5.2. Students' attitudes

Analysis of the questionnaire showed generally highly favourable responses. The highest rating was 89% (PBL was effective in clarifying concepts); and the lowest 65% (would like to use PBL again).

The subjects' generally favourable attitudes are consistent with Sun & Wilson (2008) who reported that students' positive attitude towards science correlates highly with their science achievement, and the quality of exposure (Gogolin & Swartz, 1992).

## 6. Conclusion

This study comparing the PBL approach to the conventional learning revealed that the PBL approach resulted in favourable gains on students' achievement and fostered a positive attitude toward PBL in chemistry. Teachers helped their students acquire skills they need to use in their day-to-day activities like cooperation, analysis, research, synthesis, communication and problem solving skills. Thus, educators are urged to consider integrating the PBL approach in their teaching.

Science education in Lebanon is currently undergoing reform with respect to the teaching strategies. Hence, new educational strategies that are student-centered must be adopted. PBL should be seriously considered the teaching approach of choice (BouJaoude, 2002; Colliver & Markwell, 2007).

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## A STUDY ON CASE TEACHING IN ONLINE BUSINESS SCHOOL

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### Abstract

In this paper, a case teaching in Online Business School is considered. The purpose of this paper is to consider how to effectively perform case teaching in Online Business School. Case method teaching as "the art of managing uncertainty" is a process in which the instructor serves as "planner, host, moderator, devil's advocate, fellow-student, and judge," all in search of solutions to real-world problems and challenges. Unlike lectures, case method classes unfold without a detailed script. Successful instructors simultaneously manage content and process, and they must prepare rigorously for both. Case method teachers learn to balance planning and spontaneity. In practice, they pursue opportunities and "teachable moments" that emerge throughout the discussion, and deftly guide students toward discovery and learning on multiple levels. In the Online Business School case learning, student learning time is not simultaneous. Also, the instructor cannot facilitate the class in real time. Those points are shortcomings of online business school. In order to change the disadvantages of the online class from the observation of the actual sample class, it was effective to share the students' pre-studies situation within the class. The observation was executed based on the characteristics of effective case teaching defined by Christensen Center for Teaching and Learning, Harvard Business School. By sharing the pre-studies situation, it becomes visible that the whole class has changed to a state with common values.

**Keywords:** *Case Methodology, e-Learning, Teachable Moments, Self-Observation, Reflection.*

### 1. Introduction

Whether business persons are looking to enhance their skills, or pursue a professional education, the Online Business School's learning pathways can provide them with all you need. The Online Business School delivers online university pathway programs with Postgraduate Diploma Awards to learners from all corners of the world. Learners can fast track their way through to a University Qualification by distance learning. The Online Business School web based classes allow students to learn what they want, when they want and how they want and have been designed to facilitate a much faster, more affordable and engaging way to learn. With a 24/7 network online facility, personal learning status boards, 1-2-1 online helpdesk, group webinars and bank of pre-recorded group webcasts, the Online Business School provides students with all the support that they need to succeed in developing their professional skill base and achieve a Business School qualification. After students have completed an online class, you will have an online assessment to complete. This assessment contains several multiple-choice questions. After students have completed the test, their results will be displayed immediately. If they have passed, they will receive a Certificate of Completion. When the online classes have been successfully completed, they will then be able to take the final written assignments, provided by Online Business School, that test their knowledge and understanding of the classes. After successful completion of these assignments they will receive their Diploma. They can complete these classes at their own time and pace.

In Online Business School case learning, student learning time is not simultaneous. Also, the instructor cannot facilitate the class in real time. Those points are shortcomings of Online Business School. In this paper, a case teaching in online business school is considered. The purpose of this paper is to consider how to effectively perform case teaching in online business school.

Case method teaching as "the art of managing uncertainty" is a process in which the instructor serves as "planner, host, moderator, devil's advocate, fellow-student, and judge," all in search of solutions to real-world problems and challenges. Unlike lectures, case method classes unfold without a detailed script. Successful instructors simultaneously manage content and process, and they must prepare

rigorously for both. Case method teachers learn to balance planning and spontaneity. In practice, they pursue opportunities and "teachable moments" that emerge throughout the discussion, and deftly guide students toward discovery and learning on multiple levels. In the online business school case learning, student learning time is not simultaneous. Also, the instructor cannot facilitate the class in real time. Those points are shortcomings of online school. In order to change the disadvantages of the online class from the observation of the actual sample class, it was effective to share the students' pre-studies situation within the class. The observation was business executed based on the characteristics of effective case teaching defined by Christensen Center for Teaching and Learning, Harvard Business School. By sharing the pre-studies situation, it becomes visible that the whole class has changed to a state with common values.

## 2. Previous Research

Roland Christensen Center for Teaching and Learning of Harvard Business School described case method teaching as "the art of managing uncertainty"—a process in which the instructor serves as "planner, host, moderator, devil's advocate, fellow-student, and judge," all in search of solutions to real-world problems and challenges. Unlike lectures, case method classes unfold without a detailed script. Successful instructors simultaneously manage content and process, and they must prepare rigorously for both. Case method teachers learn to balance planning and spontaneity. In practice, they pursue opportunities and "teachable moments" that emerge throughout the discussion, and deftly guide students toward discovery and learning on multiple levels. The principles and techniques are developed, Christensen says, "through collaboration and cooperation with friends and colleagues, and through self-observation and reflection." Christensen Center website explores the Case Method in Practice along the following dimensions:

- Preparing to Teach
- Leading in the Classroom
- Providing Assessment and Feedback
- Sample Class

Christensen Center website shows Characteristics of Effective Case Teaching. Characteristics of Effective Case Teaching provide the following Outcomes.

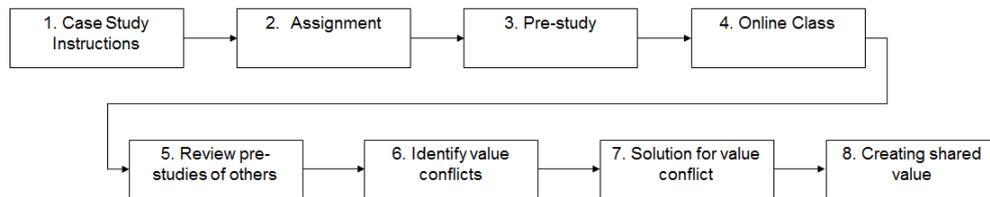
1. In-class learning substantially exceeds pre-class learning and further stimulates learning after class.
2. Learning extends beyond the individual class, yielding deeper insights through linkages across classes, modules, and courses.
3. Students are engaged in, energized by, and challenged by class discussions.
4. Students discover, articulate and develop most critical insights, with the instructor leading the process.

In the Online Business School case learning, student learning time is not simultaneous. Also, the instructor cannot facilitate the class in real time. Those points are shortcomings of online business school. In order to change the disadvantages of the online class from the observation of the actual sample class, it was effective to share the students' pre-studies situation within the class. The observation was executed based on the characteristics of effective case teaching defined by Christensen Center for Teaching and Learning, Harvard Business School. By sharing the pre-studies situation, it becomes visible that the whole class has changed to a state with common values.

## 3. Discussion

In the Online Business School case learning, Up to the present time, case teaching was an auxiliary position to online lectures. After the establishment period of the Online Business School was over, it was necessary to add a case study based on case teaching methodology as an MBA course that conformed to the global standard as a new initiative. Therefore, it was decided to develop a case learning class of Online Business School. Therefore it was decided to develop a case learning class of online business school. Since ordinary classroom class methods at online business schools cannot provide effects as the characteristics of case teaching, it is necessary to create new methods. Up to the present time, case teaching has been considered to lose the advantage of the convenience of an online business school. Therefore, it has not been adopted as an online class. This is an online business school dilemma as an innovator. Therefore, innovation to overcome this innovator's dilemma was expected. The process of that method is as shown in Figure 1 below.

Figure 1. Process of case learning in the Online Business School



In 1. Case Study Instruction, case learning practices and aims at online business school are instructed. In 2. Assignment, case materials and questions are presented. In 3. Pre-study, graduate students consider the answers of the assignments. In 4. Online Class, they watch lectures on cases on-line. In 5. Review Pre-studies of others, they review pre-studies of others. In 6. Identify value conflicts, graduate students understand the value of others and identify conflicts with their own values. In 7. Solution for value conflict, they consider realistic solutions of value conflicts. In 8. Creating shared value, they abandon their values based on their narrow perspectives and gain new shared value. The aim of these case learning practices is to reflect their own prior studies by reviewing others' prior studies. They can create a common value by recognizing that they were watching cases from the viewpoint of their own value and by finding out solutions of conflicts of value in post-studies. Observation of the results carried out by the above practices was as follows.

1. Post class learning substantially exceeds pre-studies and further stimulates learning after class.
2. Learning extended beyond the individual class, yielding deeper insights through linkages across classes.
3. Students were engaged in, energized by, and challenged by class discussions.
4. Students discover, articulated and developed most critical insights.

From the observation of the above results, the same level of effect as the case teaching by face-to-face lessons was found in the online class.

#### 4. Conclusions

In the Online Business School case learning, student learning time is not simultaneous. Also, the instructor cannot facilitate the class in real time. Those points are shortcomings of online business school. In order to change the disadvantages of the online class from the observation of the actual sample class, it was effective to share the students' pre-studies situation within the class. The observation was executed based on the characteristics of effective case teaching defined by Christensen Center for Teaching and Learning, Harvard Business School. By sharing the pre-studies situation, it becomes visible that the whole class has changed to a state with common values. The same level of effect as the case teaching by face-to-face class was found in the online class.

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## LEARNING HISTOLOGY THROUGH GAME-BASED LEARNING, SUPPORTED BY MOBILE TECHNOLOGY

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### Abstract

Digital game-based learning and the testing effect have been shown to be effective in improving learning through scientific courses in undergraduate students. The use of screens offers the opportunity to test innovative learning strategies in the classroom. Here, we report the impact of implementing a game- and testing effect-based learning tool in a histology course, evaluating aspects of perception/motivation and daily use of mobile technology. Forty students participated in the study (mean age 19 years, 60% female). The students observed a slide-based class and then participated in a mobile game using their own smartphones. The game showed questions about key concepts, previously analyzed in the class, and students were encouraged to compete for first place, defined by a score based on accuracy and time spent to answer. Two surveys, asking about aspects related to perceptions/motivations and use of mobile technologies, were applied. The game allowed for immediate feedback, revealing student performance in every evaluated concept, and allowed teachers to give corrections. Students perceived the methodology as fun, interesting, interactive and attractive. Moreover, 95% of students participated and enjoyed the game and all of them were motivated to participate in other mobile-based games in histology. In parallel, two-thirds of students use mobile technology to study and 95% to find academic information. The results indicate that students positively perceive the strategy, offering a fast feedback tool and the vast majority use mobile technology to study. Strategies allowing for dynamic relationships in the classroom could potentially improve significant learning on concept acquisition.

**Keywords:** *Game-based learning, feedback, undergraduate, histology.*

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### 1. Introduction

Various technologies have become an important tool for learning support, including mobile technologies, such as smartphones and tablets. Mobile technologies have enabled learning more accessible, being widely used informally by undergraduate students (Ciampa, 2014; Dennen and Hao, 2014; Janssen et al., 2015) and proposed to be formally incorporated into curricula (Doyle et al., 2014). It is estimated that students are more likely to acquire information from the electronic media, through different platforms, than from printed texts (Halpern et al., 2012), making mobile technology a potential useful component in the design of formal teaching and learning activities.

The use of digital games for teaching biological and health topics is an important research niche today, given the potential they have for the development of spatial visualization skills and memory retention (Tsai & Fan, 2013; Agarwal et al 2016). To date, it has been demonstrated benefits of digital games in different themes such as life support techniques, pediatrics and development of surgical skills, increasing mastery of content and motivations (Mann et al., 2002; Sward et al., 2009; Hedman et al., 2012). The field of morphological sciences is considered a complex matter for much of the students majoring in the area of health, given their diversity of subjects (anatomy, histology and embryology) and content base that are repeated during the plan studies (Anyanwu, 2014). Another aspect to consider is the terminology used in these fields, which is considered by students as difficult to retain.

This article discloses the impact of the use of smartphones for a class of histology on perceptions and motivations of health sciences students.

## 2. Design

The study included 40 students (mean age 19 years, 60% female). Inclusion criteria considered students from Kinesiology or Medical Technology, who attended the Histology course. Only students that accepted to participate and signed the informed consent were included.

## 3. Methods

### 3.1. Mobile-based game

A free application, Kahoot!, that allows to program questions in a format like trivia, was used to design 25 questions about basic concepts of nervous system histology. At the end of the class, all students connected their smartphones to a webpage, introducing a code. Every student join to the virtual platform using their real names and then the game started. Randomly, were shown 15 questions and students had 20 seconds to answer. After every question a ranking with scores obtained was shown.

### 3.2. Perception and motivations survey

Finally, an anonymous perception survey was applied to all groups in order to determine how the students felt about the learning systems they used. The perception survey was conducted with a Likert scale consisting of 4 questions with 5 options, ranging from strongly disagree to strongly agree.

### 3.3. Statistical analysis

The descriptive analysis was performed using frequency tables of categorical and dichotomous qualitative variables using absolute and relative frequencies. Quantitative variables were described by measures of central tendency (mean and median) and dispersion (standard deviation and interquartile range). Results were tabulated and analyzed using the software GraphPadPrism.

## 4. Results and discussion

In this study we report the impact of a methodology based on the testing effect and gaming, proving to be a good tool for quick feedback and as motivating and challenging tool for students.

We found that 2/3 of students use mobile technology to study and 95% of them to find academic information. (table 1).

The application of the game showed a positive attitude from students, among which 95% decided to participate in the activity. Furthermore, 87% consider the game easy to use, 92% assigned to it a value in learning and all of them would like to use the methodology in other classes (table 2). These results are well correlated with subjective appreciations, obtained in the form of free comments, showing that students perceived the methodology as fun, interesting, interactive and attractive (table 3). At the end, the percentage of mistakes for every question was shown, allowing the teacher to reinforce concepts that showed higher rates of mistakes. Interestingly, most students reinforced some histological concepts, reinforcing the idea that the methodology improves the comprehension of technical concepts. Regarding aspects of the method, the best results were seen when 15 questions were applied in less than 10 minutes, demanding a total of 15 minutes, so it is compatible with various strategies to develop working memory and higher order skills (Agarwal et al 2016). Thus, the use of cell phones does not come to change any learning environment, rather it comes to offer an additional resource to support teaching and learning processes.

Our challenge is that in higher education the use of technology for learning is in the process of adaptation, understanding and analysis (Ciampa, 2014, Dennen and Hao, 2014). Burbules (2012) defines "ubiquitous learning" as one who does "make learning experience more distributed in time and space." Despite this, there are few studies about the use of digital games for teaching morphology in health sciences. This study concludes that digital platforms are an important tool for exploring their strengths and weaknesses in knowledge, in addition to motivate them to study (Jassen et al., 2015).

## 5. Conclusions

In conclusion, students positively perceive the strategy and it offers a fast feedback tool, to reinforce key concepts in the classroom. Strategies allowing dynamic relationships in the classroom plus motivating interventions will allow to improve significant learning on concepts acquisition through morphological disciplines in undergraduate students.

Table 1. Frequency of use of different technological devices. Frequency of use per item, in percentage, is showed.

| Device              | None (%) | Little (%) | Sometimes (%) | Frequently (%) | Almost always (%) |
|---------------------|----------|------------|---------------|----------------|-------------------|
| Smartphone          | 10,0     | 0,0        | 10,0          | 22,5           | 57,5              |
| Private notebook    | 5,0      | 0,0        | 0,0           | 30,0           | 65,0              |
| University computer | 17,5     | 20,0       | 40,0          | 15,0           | 7,5               |

Table 2. Perception of the methodology. Distribution of perception in items of usability, contribution to learning and if they would use it.

|     | Easy to use?<br>% (n), n=40 | Useful to learn?<br>% (n), n=40 | To use it again?<br>% (n), n=40 |
|-----|-----------------------------|---------------------------------|---------------------------------|
| Yes | 87.5 (35)                   | 92.5 (37)                       | 100 (40)                        |
| No  | 12.5 (5)                    | 7.5 (3)                         | 0 (0)                           |

Table 3. Perception of students. Selected comments, which represent the majority that are informative or detailed.

| Student ID | What do you think the use of trivia as a teaching strategy?                       |
|------------|---|
| 5          | It's entertaining, and it is not tedious as a class                               |
| 6          | Very creative and resourceful, sense of competition leads to increased motivation |
| 26         | Good to be learning concepts more entertainingly                                  |
| 30         | I found an educational and entertaining way to learn concepts and remember        |
| 33         | Very good, because here it is checked what was studied in classes                 |
| 39         | Fun, a good way to learn and remember past stuff                                  |

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## **TEACHING ECONOMICS IN HIGHER EDUCATION THROUGH A METHODOLOGY BASED ON COLLABORATIVE WORK AND AUTONOMOUS LEARNING**

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### **Abstract**

Bologna process and the implementation of the European Credit Transfer System (ECTS) have entailed significant changes in the way of teaching at higher education levels. Among the proposed changes, the collaborative work and the autonomous learning of students play a central role.

This work presents an innovative methodology to teach Economics in higher education. The initiative consists of two main tools. On the one hand, to elaborate posters in an academic format. Such posters are developed in 4-5 student groups and are based either on an economic international institution or on a recent economic measure from policy-makers. On the other hand, to the aim of preventing the free-rider behavior inherent to group work, such posters must be developed under an explicit contract specifically design to avoid opportunistic behaviors.

The methodology is implemented in first-grade and last-grade university students. Results reveal that the elaboration of posters following a given academic format is useful to get them familiar with the ability of synthesizing, a formal citation style, among others, thus providing the student with a valuable tool for autonomous learning on a specific topic. Also, the contract established between each group members and the lecturer served to prevent opportunistic behavior among students and, in case of arising, helps reveal the identity of the free-rider(s).

We contend this methodology may constitute an interesting approach to some Bologna teaching processes, deeply rooted in collaborative initiative with students.

**Keywords:** *Economics, teaching, higher education, collaborative work.*

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### **1. Experience summary**

The use of small groups engaged in working on a task together has been referred to as “cooperative learning” (Magney, 1996; Saunders & Batson, 1999). This work focused on two widely recognized aspect of such collaboration in higher education contexts: on the one hand, autonomous learning (Macaskill & Denovan, 2013) and, on the other hand, avoiding free-riding behaviors from group members (Hall & Buzwell, 2013).

In relation to the autonomous learning thread, students are given a template to work with. This template has been thoroughly prepared to get them used to follow strict academic style to present their content. In doing so, students get used to the dynamics of synthesizing academic information, identifying key works, and structuring their ideas coherently.

Moreover, faculty members at universities traditionally used to address free riders through three main strategies: the use of a pass/fail system, the elimination of group projects from the course, or the use of peer grading to provide feedback to members (McArdle et al., 2005). This work presents a different approach based on previous signed contracts in which students clearly state the percentage of each work developed by each group member. In doing so, students are forced to reveal their contribution given they are exposed to peer screening, since the contract must be signed by all group members.

## 2. Conclusions

The present work is aimed at focusing on two main aspects related to group works: autonomous learning and free-riding behaviors. With the continued importance given by Bologna process in universities in facilitation students' learning, especially through the use of groups, the issues of autonomous learning and free riding by group members becomes one in which increased attention is needed. We contend that our findings will contribute to shed light in this area.

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## **EDUCATING FOR NATURE CONSERVATION: A CASE STUDY OF A COMMUNITY-BASED NON-GOVERNMENTAL ORGANISATION IN TRINIDAD AND TOBAGO**

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### **Abstract**

A community-based non-governmental organisation (CB-NGO) rooted in a rural coastal community in Trinidad and Tobago, West Indies, has been involved in sea turtle conservation over the past 26 years in an adaptive co-management arrangement with a governmental agency with responsibility for managing their nesting habitats. The CB-NGO has displayed success in problem-solving with regard to real life environmental challenges at the community level. A major component of its longevity is its continuous engagement in organisational learning in the workplace where its members have to keep learning new skills, and acquire new knowledge, to keep transforming itself. Using pragmatism as a research lens for a qualitative multimethod case study methodology, a single, exploratory, embedded case study approach was used, with data collected on its programmes for sea turtle activity, reforestation, eco-tourism and craft making through interviews, documents, artefacts, direct observations and information from its website. Findings revealed that incidental and tacit/implicit learning took place via learning workshops, hands-on learning and building communities of practice; and by creating a space for learning through mentoring, field visits, conferences, meetings, monitoring and evaluation, allocating physical space for meetings and networking and scheduling times for learning in the calendar of activities in the organisation. Through its organisational structure that allowed openness and inclusiveness of all members of the community, the organisation was able to inform, educate, and transform its community members, the schools in the area, and the wider public on conservation issues, while building capacity in the community.

**Keywords:** *Community-based non-governmental organisation; multimethod case study; incidental and tacit/implicit learning; organisational learning.*

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# AN EDUCATIONAL LEVEL CENTERED GROUP LEARNING SYSTEM

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## Abstract

This idea is for a learning system supporting individual and/or group study according to the student's learning level. This paper proposes a method that supports teaching by individual or group according to learning level. In our system, the instructor can set groups according to the difference of learning ability and comprehension level, and provide appropriate learning contents to individual learner or learner group, so that personalized learning is carried out even if the students are in the same space or time. Students can actively participate in learning and enhance the effectiveness of learning.

**Keywords:** *Group learning system, customized learning, OID pen, level learning.*

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## 1. Introduction

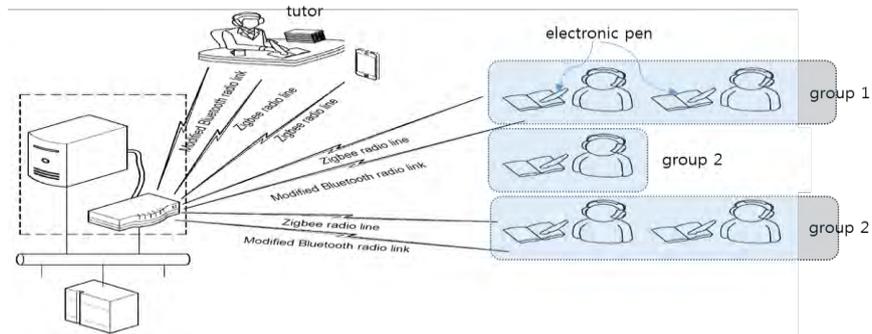
With the development of Internet and short distance communication technologies, the popularization of smart devices has become the basis for evolving education into new teaching methods in the form of smart education and e - learning. In the field of smart learning, various attempts have been made to realize concepts such as communication, cooperation, participation, opening, sharing, self-led, real-time learning management, and personalization [1-2, 4-5]. But until now, there is a fundamental difficulty in carrying out personalized learning under the considering individual comprehension in the collective learning system. It caused by that the one instructor have no choice but to manage the same contents for the textbook to all of learners, and communicate with only one of a plurality of learners [3]. In the case of e-learning performed in the classroom, the situation is similar so that it is hard to carry out individual learning on the personal level of understanding.

This paper proposes a system that one instructor divides a plurality of learners into individuals or groups, provides learning contents suitable for each group, and individually instructs or controls learning for each individual or group.

## 2. Proposed Method

The overview of proposed learning system is shown in figure 1. This system consists of three units, namely, the organizing unit, the contents providing unit and an electronic pen called object indicating device(OID) pen. The organizing unit has a role of setting learners groups according to their knowledge level and linking learning materials such as text, sound and video etc. for each group. The content providing unit delivers learning contents to the learner group. OID pen is a special device to recognize object identification from the fine codes printed on a book. This system uses HSP gateway protocol to allow a student to listen a personalized content on her/his level. In the previous system, tutors obviously suffer from teaching in the case of that learners are participated in the class with different educational materials in a mixed-ability level but OID pen is a solution for this problem. With the pen, students individually contact to the learning system through RF communications. It creates a personalized learning status database and the teacher can use it to evaluate achievement of the goal and feedback. Education can be efficiently controlled and performed by an App in the teacher's smart device which is connected to the learning system using Bluetooth or Wi-Fi. Teacher can manage their class by assigning groups with smart device. Using additional Bluetooth, teacher connects to auxiliary device and proceed with class as talking to a group(s), playing specific audio, or recording and so on. Teacher comprehends the situation on the groups in a real time and newly offers adaptive educational materials and reorganize learner groups.

Figure 1. The overview of level based learning system.



Personalized learning status data of the learner can be collected at the individual learning progress stage and it make possible to provide personalized learning content corresponding to each learner. For this purpose, as in the recommendation system, each learner  $u$  combines the learner  $u$  with the weight  $\{w_i^a\}$  indicating the relative importance of each attribute  $i$  by Eq. (1).

$$C_u = \sum (w_i^u \cdot a_i) \quad (1)$$

This weight vector plays the role of the user model. The sum of the product of the property and the weight is a usefulness function that represents the relative cost that the user has connected to the learning list for which it is recommended. Based on this, the measurable attributes are designed to be combined with each list on the system database to enable personalized, customized training.

### 3. Conclusions

We introduced a new concept that different learning contents can be provided to each learner group, and the learning progress for each learner group can be controlled individually. According to the proposed learning system, instructors can organize each class and perform a personalized learning in an interactive manner by providing the learner with the sub-learning contents related to the fine code recognized by object recognizing electronic pen. The individual learning situation data of each learner can be collected in the process of personalized learning using the electronic pen. It is possible to personalize the learning content according to the connected information of each learner. Wireless communication is recommendable in the case of linking the learner's object recognition electronic pen with the unit for providing contents. By doing so, the system can be easily installed and set up. Learning history and status for each learner are accumulated in database. By using this database, tutor can evaluate the study achievement for individuals and reorganize the educational in a real time.

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## OVERVIEW OF EMPLOYEES OF ECONOMIC-ADMINISTRATIVE HIGH SCHOOL IN THE MEXICAN REGION OF LAJA-BAJÍO

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### Abstract

According to the OECD, in February 2017 Mexico ranked among the top 5 countries with the lowest unemployment rate and third in terms of job creation. However, it is also the country that reports the highest unemployment among perspective employees with higher academic qualifications. The objective of this research is to determine what functional areas within an organization offer more jobs and help discern the labor competencies required by employers in order to provide suggestions applicable to the plans and programs of studies at the high school level. The expectation is to provide a proposal for greater correspondence between the demands of the labor market and the exit profile of basic education. A correlational documentary research was carried out to analyze the job offers of the State of Guanajuato and that later focused on the Laja-Bajío region, was published in the main employment websites of the country, including the official website. From the detailed search of the employment publications in the categories corresponding to economic-administrative disciplines, the minimum educational level required, the requirements requested and the functions to be performed for the position offered were reviewed. As a result, it was found that, of the 5,069 job offers, the selected Laja Bajío region represented 14.87%. The categories that made up the selected profile accounted for almost 50 percent of the 754 vacancies published in the region, being sales the predominant category with more than half of the vacancies offered, administration/office and accounting/finance with just over 10 per one hundred each.

**Keywords:** *Economic-administrative disciplines, employment, basic education, Laja-Bajío Region.*

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### 1. Introduction

According to the Organization for Economic Co-operation and Development (OECD), Mexico ranked in February of 2007 among its 5 members with the lowest unemployment rate, with a rate of 3.4%, which is below the OECD average, of 6.1%. According to this organization, it ranked third in terms of job creation; however, it is also the country that reports the highest unemployment among the most educated workers. Based on the National Employment and Employment Survey (ENOE by acronym in Spanish) during the first quarter of 2017, 867,000 people, representing 47.6% of the total unemployed in Mexico, have a minimum high school or higher education.

### 2. Research design

The research was developed with a quantitative approach and descriptive in scope.

The following investigation was limited only to the academic area of administrative economic sciences, due to that, according to the Labor Observatory (2013), figures obtained from the ENOE in the 2nd quarter of 2013 there were 7.2 million professionals hired. According to these figures, the most wanted or sought-after professionals are the graduates of Business Administration and Management (740,669), and Accounting and Auditing (720,237), which represents more than 20% of the total number of professionals employed in that year. The trend is repeated according to the data collected by the ENOE in the fourth quarter of 2016, of the 7.9 million professionals employed in the country, the areas of Administration and Management of companies and accounting and control occupy 838,166 and 722,446 professionals respectively, representing 19.75% of the employed professionals in Mexico.

### 3. Research objective

To determine if the labor conditions indicated as general by official studies carried out coincide with the actual conditions in the Laja-Bajío region in Mexico. The cities that conform this region are: Apaseo El Alto, Apaseo el Grande, Comonfort, Juventino Rosas, Villagrán, Tarimoro, Jaral del Progreso, Cortazar and Celaya.

#### 3.1. Secondary objectives of the research

Review the data generated by the Mexican government, related to the employers in the administrative economic areas and compare them with the graduates of the baccalaureate level.

Provide suggestions applicable to the curricula and study programs of the upper middle level, thus contributing to a greater correspondence between the demands of the labor market and the exit profile of basic education.

### 4. Method

The websites of more relevance in search of employment opportunities in the State of Guanajuato in Mexico were probed, being determined that the services of search to use those provided by the portals of OCC Mundial ([www.occ.com.mx](http://www.occ.com.mx)), Computer Work ([www.computrabajo.com.mx](http://www.computrabajo.com.mx)) and Employment Portal (<https://www.empleo.gob.mx/>), the latter being chosen not only according to the number of vacancies offered for the selected region, search engine or greater search facilities, but also because it is the official service provided by the National Employment Service (SNE), under the Ministry of Labor and Social Security.

### 5. Results

Derived from the search, the total number of jobs offered was: 3,562, which coincides with the preparation offered by the baccalaureate in the following areas: administrative, accounting, marketing (advertising and public relations) tourism (hospitality and gastronomy) and sales. The previous categories showed a total of 1,742 vacancies, which represents 48.9% of the total of the offers published in portal of OCC Mundial.

In parallel, taking the same search time in the portal of Computrabajo ([www.computrabajo.com.mx](http://www.computrabajo.com.mx)), a total of 5,069 positions were obtained. Of the categories offered by the employment portal were taken as part of the careers that are coupled to the study profile corresponding to sales; Administration / office, accounting / finance, hotel / tourism, marketing / advertising / communication, purchases / foreign trade and management. The search found a total of 2,436 vacancies corresponding to the selected categories, which represent 48.05% of the vacancies offered in the portal.

A more specific search was made for each of the municipalities that make up the Laja Bajío region. These were the results that were found:

- In the municipalities that make up the region, 754 jobs are offered, representing 14.87% of the jobs offered in the State of Guanajuato.
- Of the 754 jobs offered, 365 are in line with the categories that make up the skills acquired in the economic-administrative baccalaureate, which represents 48.41% of them.
- Of the total number of jobs offered in the different municipalities that make up the region, this type of jobs represent a percentage higher than 47%, except for the cities of Apaseo el Grande and Villagrán, where they represent 37.29 and 18.18% only.
- The municipality of Tarimoro does not have publications on online portals corresponding to job vacancies. Likewise, it has no companies registered in the Business Information System (SIEM).
- Regarding the total number of jobs coinciding with the skills taught in the region's baccalaureate, in the municipality of Celaya 298 vacancies are offered, representing 81.64% of them.
- Analyzing the most outstanding categories, the prominent one corresponds to Sales, since it reports 63.56% of the Laja Bajío region, and represents 51.4% of the total of the State of Guanajuato.
- The second most outstanding category is administration / office, with 15.62%, and the third accounting / finance with 12.05%.

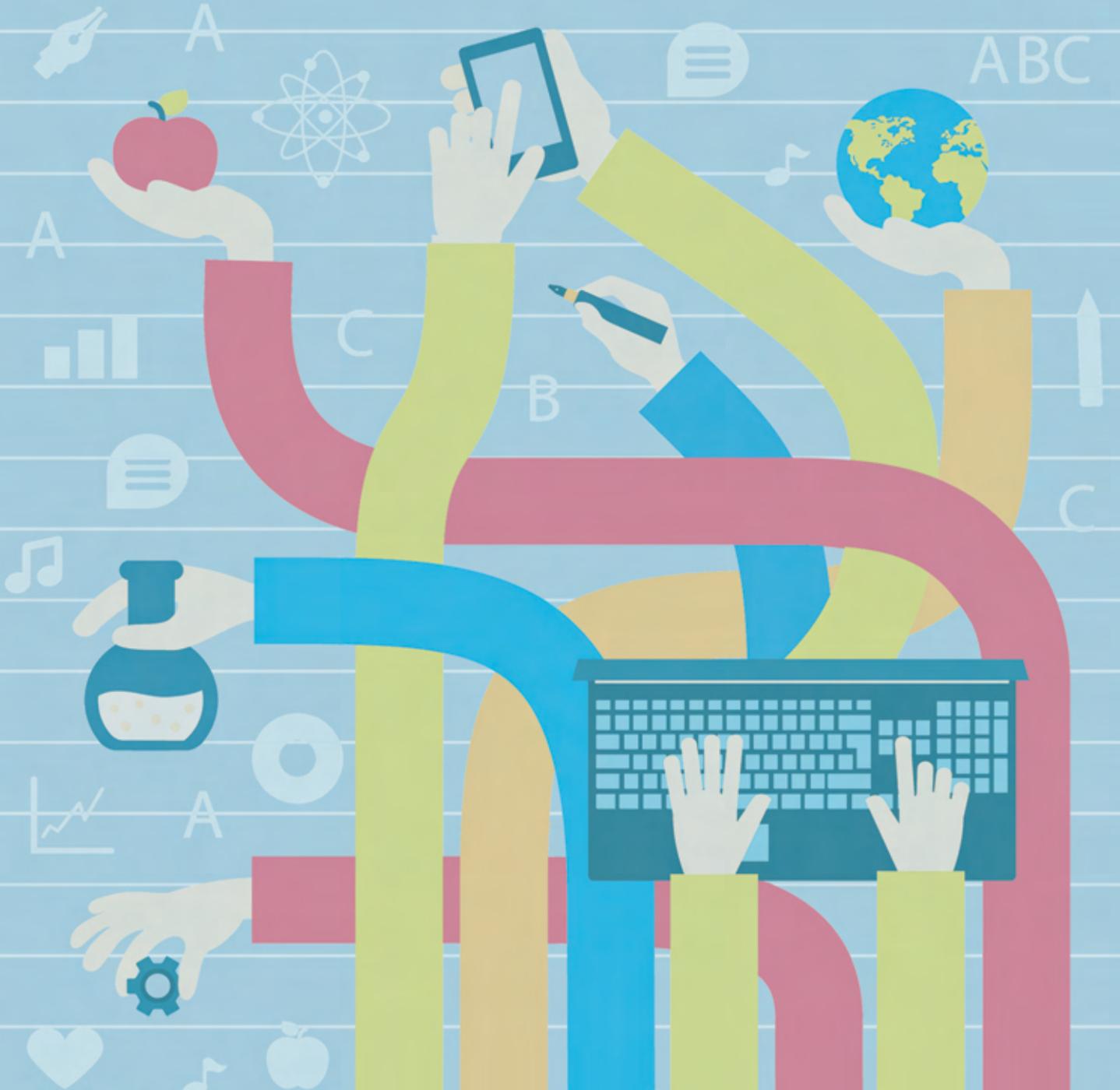
## 6. Discussion and analysis

The data collected shows a similar behavior trend in the employment websites, which coincide with the trends pointed out by official institutions at the national level; however, in the region researched it can be concluded that the proportion is even greater. The proposal would be to redesign the plans and programs of study at the upper intermediate level emphasizing the acquisition of competences in sales, in order to achieve greater coherence with the current requirements of the labor market in the analyzed area.

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# VIRTUAL PRESENTATIONS





# **TRAINING TEACHERS FOR TOMORROW; ISSUES, TRENDS AND QUESTIONING THROUGH TWO EXAMPLES OF INNOVATIVE TRAINING METHODS**

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## **Abstract**

How we approach teacher training today raises several questions and issues. Considering the context of a worldwide society and constant changes in technology and globalisation, the evolution of our education systems is directly and seriously impacted. Thus, Innovation In Education (Cros, 1997, Gunnarsdóttir, 2013) can be seen as the future of education in Europe (Gunnarsdóttir, 2013). Through the introduction of new innovative training modules (Choplin, 2002), teacher trainers could now address the problems raised by such rapid change.

This communication aims to present two innovative training programs that have been implemented in a Teacher University in Switzerland; one about an initial innovative training program on creativity, another one about an innovative continuing training course on yoga as a tool for teaching and learning and to analyse their features in order to seize their impact on the quality of tomorrow's education.

Through these two examples we mean to explore the issues pertinent to training teachers today, for tomorrow.

**Keywords:** *Teacher Training, Innovation, Creativity, teaching/learning studies, training programs.*

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## **1. Training teachers for tomorrow; a brief introduction**

As Hargreaves (1994) pointed out, Education must be thought within the context of postmodernism which has the characteristics of rapid and strong changes amongst institution, and school is deeply concerned. In this particular context, it is often pointed out that teachers suffer massively from difficulties, leading to quitting, or professional burn-outs (Karsenti, Collin and Dumouchel, 2013; Lantheaume, 2008). On the other side, the number of cases of dropping out of school are increasing, and pupils are constantly more to be unmotivated and discouraged (Blaya, 2010). Constant and rapid changes, exponential social and technological evolution, multiculturalism, kids with special needs are examples of what needs to be taken into account to envision the contemporary Education. From this point of view, it is pertinent to question teachers training, to address these issues. In Switzerland, teacher training is fulfilled by Pedagogical Universities, in a dual training system; theory and practical training simultaneously shape the program. Teachers are initially trained this way during various years –depending on the educational level they wish to teach. Continued training and postgraduate courses exist as well, to major their skills all through their career. The considerations proposed here take place in this context and offers to study two specific courses, designed within innovative approaches.

## **2. Methodology and theoretical framework**

In order to cross data and put them in perspective, it was chosen to use two case studies, and link them through the idea of innovation in teacher training, serving professionalization in the particular context of constant and quick changes.

This project embeds itself in the Participatory Action Research framework, as we are describing and analysing items in which we actively take part; this kind of methodology aims to advance both science and practice (Whyte, 1991), alternating reflections, analysis and action. Both cases have been rooted in a particular theoretical context, and built up within them. Data has been systematically collected through different ways and cross-analysed. At the end of both programs, the same quiz has been collected, with questions about the learnings, the links with practice and professionalization potential of the training.

The first case becomes rooted in a cognitive psychology framework; creativity is seen from a differential psychology point of view, where creativity is the capacity to find new solutions, adapted to context (Lubart, 2003). We understood creativity as potential professional skill for teachers, that could help them to face different problems they meet, but also as a transversal competence for pupils, that can use it to learn better, as it is stated by the Western Switzerland scholar curriculum (CIIP, 2010). The second one also lays within a cognitive framework, with specific orientation of neurosciences and brain studies (Della Chiesa, 2007) that consider brain, body and emotions as a whole system (Dai and Sternberg, 2004; Boroditsky and Ramscar 2002). Specific contributions about yoga approaches at school (Wagener, Boujon and Fromage, 2011; Laborde, 2006; Rohard, 2004) have backfilled this theoretical background.

### **3. An example of innovative program; Creativity on board**

One issue within the questioning we are dealing with concerns the professional development of teachers in the context mentioned above. Indeed, a methodological approach of applying rules to typical situations can obviously not be used anymore, and training is now trended towards lifelong learning (Knapper and Cropley, 2000), with the aim of educating reflexive practitioners (Schon, 1983; Altert, Perrenoud and Etienne, 2013). From this perspective, *Creativity* can be considered a professional skill for teachers (Terzidis, 2016), and training them for it represents an important issue in today's education, as well as fostering creativity throughout the whole educational system (Rey and Feyfant 2012; Taddei, 2009). Based on this idea, a training module for a western swiss university was designed, intending to teach creativity as a stand-alone subject, (Terzidis, 2014) including, creative pedagogics and reflexives issues, through blended learnings (Page & Thorsteinsson, 2008), creative learnings and teachings (Craft, 2005). The innovative dimensions of this particular course take the form of didactical, pedagogical and technological components. As a matter of fact, students are required to be immersed in creative processes, in order to live them from the inside and therefore, to think and learn about theoretical features about creativity. This inverted system is accompanied by an e-learning program where students can learn by themselves, to their own rhythm –within headlines and deadlines-, collaborate and adapt learning times to their professional schedule. Last but not least, theoretical and reflexive contents are offered to student to be creatively learned, through workshops and cooperation.

The analysis of this module has been lead through a diachronical study, before, during and after the course, using different types of data (course guideline documents, data from tasks completed by students, and final quiz about students' opinions). This in-depth research (Terzidis, 2016) has brought out different items that emerged. It has been showed across these categories, that training teacher to creativity, through this particular system, was contributing to professionalization, as students are brought to develop a sharper consciousness of what they are doing and why, a modification of the point of view they had on the profession, a (re)insurance of their abilities to teach and use creativity, and a mastery in creative skills that can be used in teaching and learning processes. What is negatively mentioned concerns the time factor; if this six month module tends to improve professionalization, the training time appears as way too short to really take it as granted, and the principle of immersion used among this program requires time to come to terms with such processes. As well, the time of practice and expertise of students seems to weigh on the ability of dealing with creativity in the professional context; students with short or no practice dare less and have less materials to create adequate responses, as students with some years of practice are more in a position to be creative and to foster creativity with their pupils.

### **4. Another example; an holistic point of view of teaching and learning**

Another important question stands in the existing changing educational paradigms to empower teachers to provide better and easier teaching; thus enabling them to create a stimulating and efficient learning environment for their students. One of leading paradigm within educational training at present is that of a particular cognitive point of view, which assumes learning only in terms of brain concerns (Dai & Sternberg, 2004). Current research into the roles of emotions and body in cognitive issues may pave the way for a new era of pioneering training methods. One such program, drawing its inspiration from this changing paradigm (Andrieu, 2007; Corbetta, 2000), offers to study aspects of yoga to greater improve learning and teaching potential. (Wagener, Boujon and Fromage, 2011; Laborde, 2006; Flak and Coulon, 1985). A continued training course for teachers, still in a western swiss teacher university is exploring the potential of using certain aspects of yoga in schools, with particular focus on the emotional, metacognitive and physiological conditions found within learning and teaching. (Terzidis, manuscript in preparation for submission).

This innovative topic for teacher training, is studied through workshops and courses that allows students to experiment yoga for itself, therefore reflects upon its features and the ways it could be used to optimize teaching and learning. Didactical and pedagogical leads are given as well, and the participants are asked to test them in their classroom between each session of the day. This program has been lead two years through, with different kinds of teachers interested in these questions, from different schools, through seven training sessions of three days, with about fifteen teachers at each session.

A quiz about participants' opinions has been systematically collected, with a hundred people. The data is being analysed more deeply at the moment, but the first results are showing serious links between this training and professionalization. What mostly comes through is the power of this kind of training in offering reflexivity about how teaching and learning are understood, for instance the strong link between body and mind, the point of view about movement in the classrooms, the way emotions and cognition are embedded. The second point generally mentioned is the way this training offers real potential implementations to improve profession and quality of learnings, like using breathing control, stress management, body consciousness or even postures to deal with problematic situations on the teacher side or the pupils side. The possibility of living such processes and test them with feedbacks. The main limits pointed out consist of not being sufficiently trained and the prejudices that colleagues or parents could have about these kinds of approaches.

## 5. Discussion

Obviously, these two case studies need to be put in perspective with other ones, within a longitudinal approach, in order to understand better all parameters of innovation and their impact on teacher training.

However, through the examination of these two specific training programs, we could design some outlines that may answer some of the major problems that teacher training seems to come across (Navaro and Verdisco, 2000); failure in pedagogic methods used to teach teachers (frontal, constructivist and individualistic approaches), failure in the content of training, failure in the impact of training, failures in integrating teachers into the larger context of education policy. (p.11)

The main obstacle that comes along with both cases seems to constantly be problems linked with time. Training asks for time, and becoming a professional even more. This is a major problem that trainers and Educational policy maker need to take in consideration. A possible solution could lie in a larger scale of continued training, which would provide a monitoring about skills development. Another contribution to this problem resolution stands in the use of e-learning, as some students have noticed: these specific training modalities offer to students a good way of managing their time and learning at their own rhythm, which is a crucial point in learning process.

Some further research should clarify specific innovation features that could improve and optimize teacher training, but may also think about how this could be transferred into classrooms, with innovation benefits for teacher practice and for pupils' learnings.

## 6. Conclusions

Through two actual training programs, we have presented particular ways of thinking teacher training. By innovative didactical, pedagogical and paradigmatical approaches, we have noted an obvious positive impact on professional development. The deep personal involvement, the collaboration, the mobilization of innovative topics (creativity, body and emotions within learning process), as well as the radical change in the points of view about teaching and learning and last but not least the uses of e-learning as a learning medium seem to play a large part in teacher training in the mentioned context. To address an educational context where instability, complexity and constant evolution rule, teacher training and decision makers need to think outside the box and implement innovative ways to think the Educational professions, thus the training.

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## **TEACHING STRUCTURAL ENGINEERING TO ARCHITECTS** **Structural Mechanics vs. Structural Design mix within the curricula**

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### **Abstract**

#### Introduction

A long-term research analysing role of Structural Engineering (SE) in architectural curricula is currently taking place at the Faculty of Architecture, Czech Technical University in Prague. We are comparing its study programmes to ones of selected leading English (12) and German (15) speaking European universities together with looking into innovative methods of teaching.

#### Previous findings

SE appears to be an important part of architectural curricula, its share ranges as follows:

#### Bachelor

10-15% (English)

15-25% (German) and 35% for top rated universities.

Majority of master architectural courses have up to 5% of SE in their curricula.

For combined courses of Architectural Engineering, the share of SE can be further boosted up to 45%.

Student-centered instructional and constructivist approach seems to be more beneficial for architectural students compared to traditional teacher-centered instructional and behaviourist approach.

#### Objectives

The main objective of this paper is to examine approach of particular universities from our sample as far as Structural Mechanics vs. Structural Design mix within their architectural curricula is concerned.

#### Methods

Applied research: comparison, observation and analysis.

#### Results

Structural Mechanics (SM) courses represent theoretical introduction into basic laws and principles of mechanics, on which further builds up Structural Design (SD). The ratio of SM vs. SD subjects in the curricula ranges considerably within selected universities (see detailed analysis).

#### Conclusions

Our research has not found "universal" approach towards the problematics. Some universities from our selection put an emphasis on students' understanding of mechanics' principles, some prefer "learning by doing" approach (see the full text for more detail).

All students practice gained skills within their individual projects in later stages of their studies.

**Keywords:** *Structural engineering, architectural curricula, education.*

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## **1. Introduction**

Department of Load-Bearing Structures at Faculty of Architecture, CTU in Prague, is one of the academic institutions that monitor trends and developments in the field of teaching Structural Engineering to future architects. At the present time, not only situation at selected European German and English speaking faculties of architecture, which regularly take premium positions in various independent surveys, is kept under observation, but followed are also significant oversea institutions such as MIT, Cambridge, United States etc. (especially for its use of graphic statics as a mean of explaining and illustrating structural behaviour). We look both into quantitative (time devoted to Structural Engineering subjects in curricula) and qualitative (methods of teaching with emphasis on "innovative" ways) aspects of teaching statics and related subjects. The content of our courses is reviewed annually to make sure it is up-to-date and relevant. Particular courses are regularly updated as a response to our research as well as to students' or lecturers' feedback, reflected are also professional accreditation requirements, funding changes and variations in student or staff numbers.

## 2. Previous findings

In order to find out whether Structural Engineering is an essential subject in Architectural Courses at European universities, a study has been conducted by the Czech Technical University in Prague (Pospisil, Vavruskova, 09/2014). For the comparison with the Czech Technical University in Prague, 27 leading European German (15) and English (12) speaking universities have been selected in accordance with rankings listed in the article (University Rankings). There are currently two main types of architectural courses: Architectural Engineering (AE) and Architectural Design (AD). Share of Structural Engineering in curricula varies according to the type of course as well as type of university. Following courses were taken into account whilst comparing the amount of Structural Engineering in curricula: Structural Mechanics, Statics etc. (for Structural Mechanics part), resp. Concrete Structures, Steel Structures, Wooden Structures, Foundations etc. (for Structural Design part). All universities employ ECTS (European Credits Transfer and Accumulation System), which has been used as an objective quantity indicator. Further studies of our team were later devoted to the problematics of most suitable teaching methods and strategies (Pospisil, Vavruskova, 06/2015) together with sharing our findings in connection with introducing an innovative seminar of Visual Statics at our faculty (Pospisil, Vavruskova 07/2016).

## 3. Objectives

With the intention to further broaden our analysis of Structural Engineering subjects in architectural curricula mentioned above, in this paper we would like to concentrate on the ratio of Structural Mechanics (SM) vs. Structural Design (SD) subjects within the study plans of universities from our selection. Our aim is to find out whether there is a general prevailing attitude to setting the appropriate balance between theoretical lecturing of SM and its practical adaptation in the form of SD, or to observe and discuss pros and cons of particular institutions' potential various attitudes towards the issue.

## 4. Observations, results

### 4.1. Types and duration of architectural courses

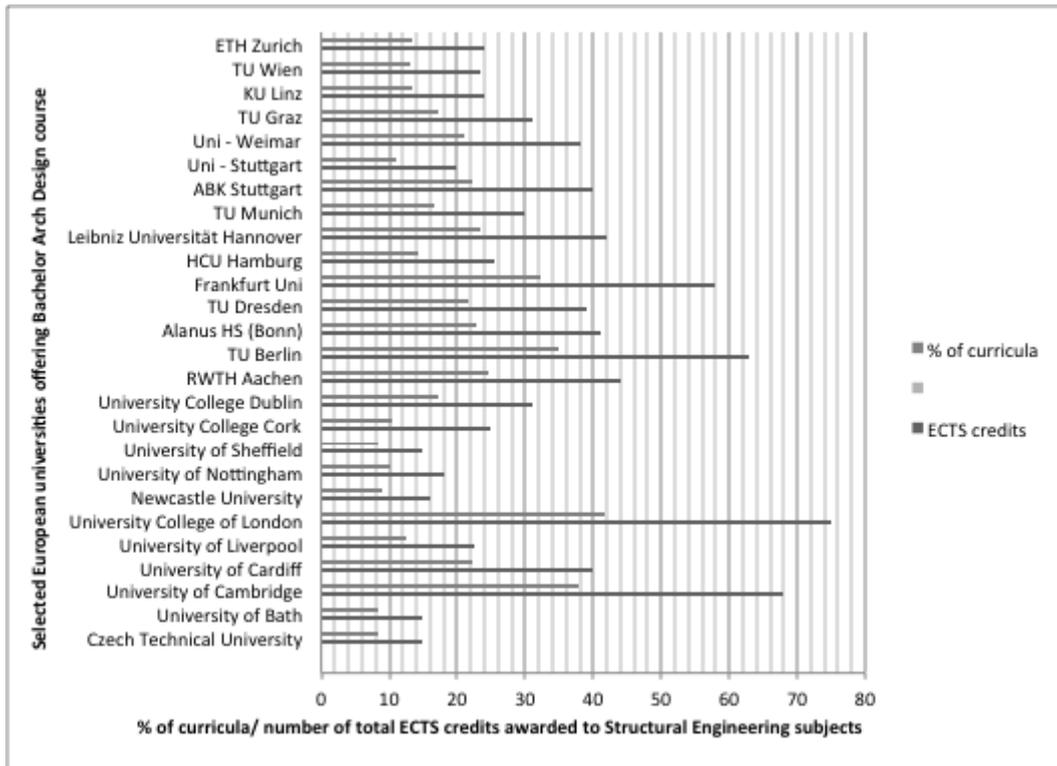
Bachelor courses of Architectural Design (AD) at universities from our sample take three years all with the exception of University of Bath, UK and TU Munich, Germany (both have compulsory additional year designated for architectural practice resp. for studying abroad). Two other universities from our sample (Uni Stuttgart and HS Alanus Bonn, Germany) have recently changed its curricula schedule from 4-year programme to 3-year plan. Bachelor courses can be later followed by master courses in the duration of additional two years. When our research took part in 2014, only five out of the 27 selected European universities (University of Edinburgh, University of Dublin, University of Glasgow, University of Bath, CTU in Prague) offered Architectural Engineering (AE) courses; at the present time they are offered also by UCL London, University of Cardiff, Sheffield and Liverpool, UK. Their length varies between 3 to 4 years, they are categorized as either bachelor or master (see Fig.3 and Fig.4) and have its own study plans different from AD. To compare it with the situation in Germany, there are no specific AE courses, however students can choose Structural Engineering specialization in their master studies of AE which results in even greater volume of their curricula devoted to SE in their later studies (up to 45% compared to 35-40% for specialised AE courses in the UK).

As observed earlier, Structural Engineering seems to have an important position in bachelor stage of both AE and AD studies (Pospisil, Vavruskova, 09/2014), therefore we would like to focus on bachelor architectural studies in this paper. Position of SE subjects in master studies further polarizes into practically disappearing from the curricula of AD and/or playing dominant part for the AE curricula.

### 4.2. Structural Mechanics (SM) vs. Structural Design (SD) mix within the curricula

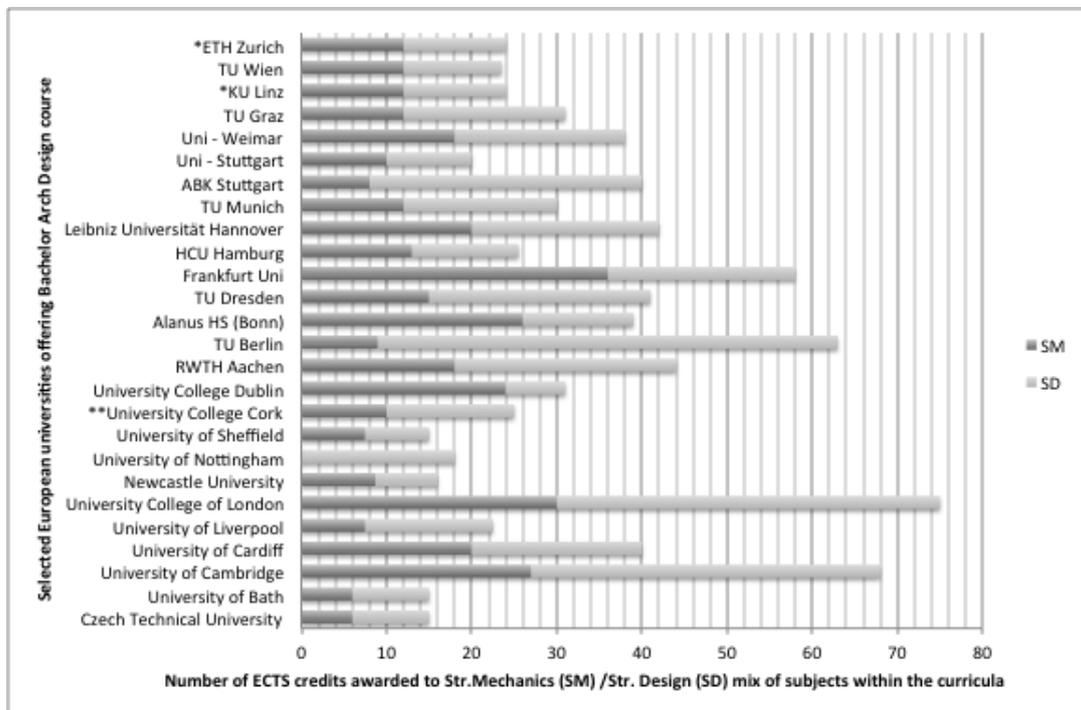
Structural Mechanics (SM) courses represent theoretical introduction into basic laws and principles of mechanics, on which further builds up Structural Design (SD) with detailed design of particular structural members. In order to illustrate general situation concerning SE subjects in architectural curricula, we would like to present Fig. 1 (bachelor AD) and Fig. 3 (bachelor/master AE), which show both volume of SE subjects (number of ECTS credits) and its % share curricula. German speaking and top-rated English speaking universities from our selection show overall higher volume of SE subjects in their bachelor AD curricula.

Figure 1. SE subjects in bachelor AD curricula.



As seen on Fig. 2, the ratio of SM vs. SD subjects in the bachelor AD curricula ranges considerably within selected universities.

Figure 2. Mix of SM vs. SD subjects in bachelor AD curricula.



Following figures (Fig. 3, Fig. 4) illustrate analogically the situation concerning AE curricula. On the contrary to SM/SD mix within AD curricula, where general attitude towards its ratio cannot be conclusively identified, the amount of SM vs. SD seems to be equally balanced in AE curricula.

Figure 3. SE subjects in bachelor/master AE curricula.

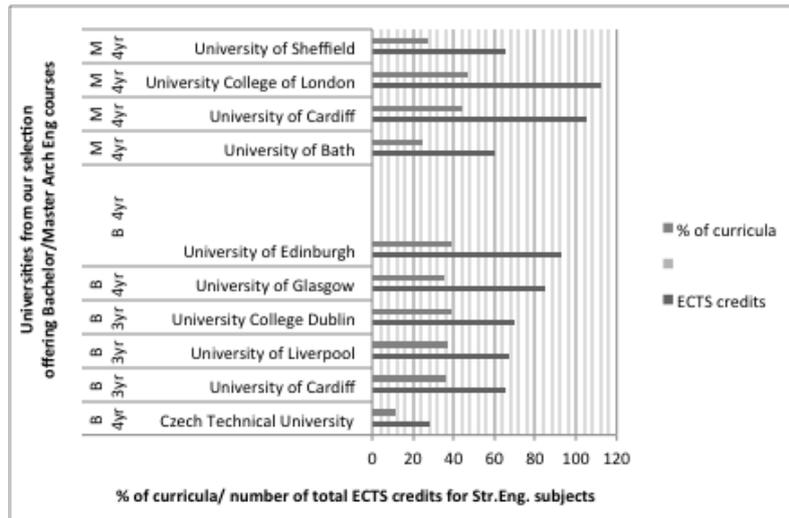
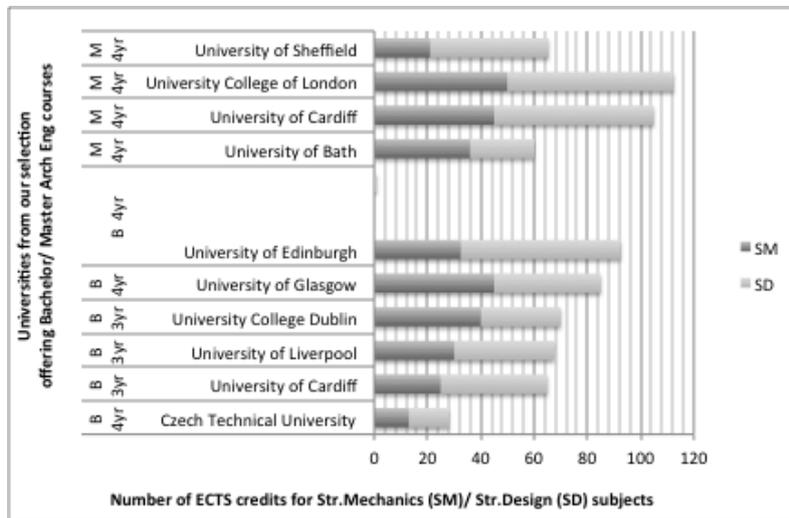


Figure 4. Mix of SM vs. SD subjects in bachelor/master AE curricula.



### 5. Conclusions, practical use of our research

According to our findings, and especially for Architectural Design courses, our research has not found "universal" approach towards the problematics of optimal ratio of Structural Mechanics vs. Structural Design courses in curricula. Even though some universities from our selection put an emphasis on students' understanding of mechanics' principles (and put more theoretical SM lectures into their curricula), there seem to be a certain inclination towards predominant gaining practical skills (more SD), either by working on case studies followed by individual projects or by "learning by doing" approach (e.g. Experimental Constructing in HCU Hamburg or Practical structural modeling exercises at University of Nottingham, UK), that help students develop a basic understanding of structures' behaviour and understanding of the interaction between structural form and the loads the structures have to carry.

Although it might seem that some universities show comparable amount of SE practice in their curricula, it would be worth conducting further detailed analysis, which would take into account the amount of SE practice within students' individual projects (e.g. both AD courses at University of Bath and CTU in Prague show approximately same amount of SE subjects, however the first mentioned shows twice as much ECTS credits devoted to individual projects, which in our opinion reflects upon the time devoted to structural design.)

As already mentioned, our research contributes to regular curricula reviews of Structural engineering courses at Department of Load-Bearing Structures at Faculty of Architecture, CTU in Prague. We would like to highlight our newly introduced Visual Statics seminar, which was inspired by monitoring "innovative" teaching methods applied at world significant institutes (offering architectural courses) such as MIT, Cambridge, United States or ETH, Zurich, Switzerland.

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## PROFESSIONAL DEVELOPMENT IN HIGHER EDUCATION: THE USE OF PLC'S TO FOCUS ON TEACHING

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### Abstract

Remaining relevant to pre-service teachers is a concern for faculty in higher education. This challenge may be exacerbated when classroom practices include changing technology and a generation of pre-service teachers who live within an electronic social network that includes their classrooms and professional networks. A departmental professional learning community (PLC), defined as an organized focus on the “process of intensive reflection upon instructional practices, benchmarks, and outcomes to ensure success and enable teachers to continually learn from one another via shared visioning and planning, as well as critical examination of what *does* and *doesn't* work (DuFour, 2004), was the chosen method to investigate teaching practices. Typically considered a strategy for classroom teachers in grades K-12, a PLC was developed at a college of education in order to support faculty in teacher education as they focused on updating their teaching to include current practices in K-12 classrooms. Department administration, operating from the unique insider perspective of seasoned faculty members now serving as department and assistant department chair, distributed surveys, held focus groups and sponsored collaborative events both on and off campus in order to encourage an atmosphere of collegiality mediated by a focus on teacher excellence. The resulting home-grown PLC offered faculty engagement across the department, an increase in student learning within courses, and a source of continual renewal among the PLC stakeholders. Evidence showed ongoing expansion of leadership roles as an outcome of the practice. This research contributes to the field of teacher education in multiple ways. It is our belief that this initiative has fostered development among our departmental colleagues *and* our students. It offers faculty a model for professional development that fosters collaboration and socially responsive support among peers. Additionally, it provides a platform for teacher educators to model effective instructional techniques for pre-service teachers and then to serve as a departmental expert and leader in training colleagues. Students have been able to observe a PLC at work much like the PLCs in which they will participate during their future career as teachers. Moreover, the use of cutting-edge technology and innovative instructional practices may impact the work that our pre-service teachers do in their own classrooms, thereby promoting greater opportunities for academic success for their own students.

**Keywords:** *Teacher education, professional development, higher education, collaborative communities, innovation.*

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## INCREASING QUALITY OF SCHOOL EDUCATION ACCORDING TO CORRESPONDING EDUCATIONAL TECHNOLOGY CORRELATION WITH MODEL OF MIND ACTIVITY\*

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### Abstract

New requirements and societal expectations placed on graduates for the XXI century, demand increasing quality of education at every step and level of learning. The conception of ‘lifelong learning’ demands understanding of quality ways of learning for receiving significant results. Our experience of connecting educational process using mind model / also referred to as an information perception by a student, is based on the concept of triadic code. The results of the research work that used triadic code show increase attainment of students and generally better results of studying in all levels of school education. Overall, the quality of the product could be assessed in the following way – is the means by which to reveal the correlation between the end product to a standard product (relative quality) or the ideal product – the absolute quality. We suppose that in order to reach the absolute quality in education we must take into account the differences between our students when designing the curriculum. In our methodology we use the theory of a triadic code as base for educational technologies. In philosophy the idea of a triadic code goes back to ancient times. Plato used this idea for description of a society.

On the one hand, it can be argued that education has two main functions: to educate and to train. If they don’t go together in childhood, the education of a student can deteriorate and it will be difficult to correct it. To clarify each of the issues, when developing a curriculum first, we have to teach ‘WHAT IS IT?’ On the other hand we represented education as a process by means of which a teacher teaches ‘What is it?’, ‘How to use it?’ and ‘Why should I know it?’ These are also the major questions we ask ourselves during our lifetime and which are raised by our thinking.

**Keywords:** *Quality of education, image of mind activity, triadic code, model of information thinking, personality model.*

### 1. Introduction

A lot of changes in social life give rapidly changing of necessary technologies for future. Each year’s new demands of people are to obtain new methods and results of learning for their life. People must have constant readiness for change for new life, the ability to adapt quickly to the changing environment and professional experience in the field of information technology. We consider that the progress of the evolution of educational systems is a process that is closely connected with social evolution. We can see advanced contemporary society which is connected with new technologies. This process demands to increase educational level of population according new demands and challengers. We want argue one of the way how we can make education more effective.

Different people have different type of consciences and we can illustrate these with our mind model. Our investigations show possibility of increasing educational quality through the deep understanding of how individuals reason and think. We are using special model of thinking created to help to develop the educational process.

The information structure of human thinking allows determine a specific natural information code of thinking, because each person thinks individually. The individual’s natural information (triadic) code indicates the structure of personality more accurately than any other off-system characteristic.

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The definition of the triadic code can be made through a test questionnaire. We make different questionnaires for every level of educational system. The interaction between a teacher and a student on a content basis for a specific purpose and the use of wide range of methods is an essential feature of the pedagogical process, which takes place in any educational system. A teacher is a model for a learner and thus, the learner is a prototype for the teacher so, the purpose of training for the teacher is to make this prototype a model student.

The quality of the education then can be assessed by methods and models of educational approaches which we are used in practice. Usage of this idea let us increased the quality of education, and we receive this result in our pedagogical experiment.

We also utilised a number of complex systems of monitoring the educational process based on computer test results and outcomes of studying and learning with special tests of personality/ability to comprehend the information. In practice for effective monitoring of educational process these tests can be conducted twice a year. According to our model of human mind every student (and individual) has his natural information code of thinking. But the question is how this principle can be applied within the educational context?

## **2. Structure**

It can be supposed that there are two main functions of education: to educate through giving information and to train for using this information. And if they don't correlate to a child's age, the education of a student can deteriorate and it will be difficult to correct it. To clarify each of the issues first we have to study "WHAT IS IT?" for "realizing", then to fulfill the task using intellectual technologies as it allows us to understand the aim of our work: what students get (and sometimes their parents), what teachers and school obtain. And if you look at these concepts of education, then how will the solution of the raised questions affect the students' ability to receive knowledge, the process of learning as it is and self-education?

## **3. Objectives**

Our aim was to explore the possibility of the creation in pedagogy and education of new approaches to teaching and learning which would optimally correspond to the informational structure of the active brain of the student and, as such, allow optimising all processes of education in primary and secondary school.

The focus of our research was to assess the extent of the development of students' cognition at any point of time by a specially designed questionnaire. We then also suggested a number of individually tailored techniques to advance students' cognitive development. The point of discussion is the liberal pedagogy and in particular the kind of education of a person and society, which will be suitable for any school, university or country. On the whole our pedagogy is to be based on human brain, but not only on the experience of generations of teachers. The development of the educational system causes social changes and is possible only through the understanding of the ways we think.

## **4. Methods**

In our research project we have studied education from the perspective that education is one of the fundamental parameters of social systems. Processes of social dynamics depend of educational system in all over the World.

The tools that have been used in our research work included: extensive review and analysis of social and educational policy documents, the data and findings of the mathematical modeling of educational processes in different situations, and mathematical modeling of mind with triadic code and developing teaching and learning methods and strategies for the different types of personality and students' cognition. At the basis of our work is our developed theory of students' thinking and ability to comprehend information. We have developed and employed individual learning styles for our students according their type of thinking. The empirical work on which the study is based was carried out in two schools in Moscow (both in primary and second level classes) as part of the pedagogical experiment.

This work was carried out in two schools in Moscow in the period from 2007-2014 with a number of classes. The research used specifically designed questionnaires through which the type of thinking/ informational structure of the brain of each participating pupil was identified. In more details, we conducted a pedagogical experiment to show effectiveness of using our technology for increasing quality of studies. We will discuss this work in our paper in more detail. The analysis of collected data was carried out and special recommendations in relation to the development of individual learning plans were given to pupils, teachers and parents. As a result of students' participation in research the attainment

levels of students have improved, while their communication skills have also advanced. We will conclude that using feedback with complex of computer programs could let us develop all parts of student personality through planning individual portfolios of learning according to students' triadic code.

## 5. Discussion

Education is a process by means of which a teacher teaches "What is it?", "How to use it?" and "Why should I know it?" These are the three major questions we ask ourselves during our lifetime and which are raised by our thinking. These questions are very important for students for making inner model of the World. They help to find what of direction is basic, what helpful and what addition and week for a person.

These are the questions that a teacher will consider educating his students. During the learning process a student will find answers to these questions in his own way according to the extent of knowledge, depending on his age and natural development.

Today in science and technology there have been significant discoveries which can be made by only highly educated people. Further modernization of education and educational technologies is the way for development of intellectual potential of the society.

The information structure of human thinking allows determining a specific natural information code of thinking, because each person thinks individually. According to the nature of human mind every person has a natural information code of thinking, which may serve as the basis for the educational process.

We are interested in this particular structure of human brain, as it can build a new pedagogical theory for the future which relates not only to the ordinary realities of social life but to any school, any institution and any educational establishment which refers to cooperation among people and, which is most important, to the development of man himself. The individual natural information (triadic) code indicates the structure of personality more accurately than any other off-system characteristic.

The definition of the triadic code can be made through a test questionnaire that was created special for this project.

The interaction between a teacher and a pupil on a content basis for a specific purpose and the use of wide range of methods is an essential feature of the pedagogical process, which takes place in any educational system. A teacher is a model for a learner and thus, the learner is a prototype for the teacher so, the purpose of training for the teacher is to make this prototype a model student.

### Teacher's tips

Using the principle of student critical thinking, you can implement a new approach to the patterns of learning. This allows us to develop collective mind in the classroom or in the audience. In the process of self-education and in the collective search for truth which is based on the goals and objectives of the lesson, the students themselves organize collective thinking. The system of "student - teacher" becomes inner-direct, i.e. the collective sphere of thought and all the events that occur during each session will also be in a process of collective thinking. Thinking has its own laws and in the classroom students will work together to seek the truth as it makes everyone think individually. This method allows us to make the pedagogical process natural.

Collective thinking process builds a structure of individual thinking.

The three-dimensional model of the macrostructure of the active brain of a pupil according to its functions has been identified in the process of the research work carried out in two schools in Moscow in the period from 2007 to 2015. Brain is the place where an idea is born. That is to say "the womb of mind". The community brain is the place where it becomes the mind of the universe in the intellectual development. The procedure of the birth of thought is on the transition of the brain perception, as well as the well-known community of language and the order of combining the words into sentences to use. Thought is the generation of brain, its individual work. The procedure of the birth of thought and the process of thought connection into a coherent whole is a very important mechanism for the birth of a single prototype - the world in general and the inner world which a person is aware of.

The structure of the human brain is the base for triadic code. This is a microstructure (the physical brain) aimed at the mathematical functional maintenance of a second brain (a macrostructure), an intellectual brain. This brain consists of three hypostases: Ascolta, Trascrizione fonetica, Intellect (temporal lobes) with a comprehension and outer world building function. Sensus, mostly connected with emotions and based at frontal lobes with an evaluation function of two other hypostases. Will connect with parietal lobes and it is a base for an action function, an experience accumulation, intellectual work and physical brain control function, controlling the outer world via it. An intellectual brain we give the name of 'Geneon', because it is a base for making a person genius.

We will introduce the concept of triadic code. There is an individual developmental system of Geneon. Although all its Hypostases are somehow present on all the stages of individual development of a human, and they are somehow partake in his development, there is nevertheless a consecution in the

stages of the process. The first stage is Intellect Hypostasis preferred development (primary outer world comprehension, language acquirement etc.). The second stage is Will Hypostasis preferred development (first manifestations of activity). The third stage is Sensus Hypostasis preferred development, an individual human basis. This is a final period, stage, and phase of individual formation and own Geneon.

Any human's individuality comes through the same stages of development; however, every human comes through it differently. Eventually, we have individuality with different Geneons. Firstly, as a result of this process, every hypostasis takes one of the three places – a dominating, subordinate, or recessive one. Secondly, absolutely all Geneons differ from each other in Hypostasis filling levels, in the quality of acquired capabilities and properties of individuality. Thirdly, the triadic code defines the scope of the differences, so that every individual Geneon receives a life-long psychological formula for any given individuality.

The preferential (domination) level of the three Hypostases gives six positions: Individuality with different intellect, Sensus, and Will domination placement.

ISW formula: the Hypostasis of Intellect dominates, Sensus is Subdominative, and will is recessive. IWS formula: intellect, will, sensus. SIW: sensus, intellect, will. SWI: sensus, will, intellect. WIS: will, intellect, sensus. WSI: will, sensus, intellect. There is an individual dianon inside of each of the hypostases. A model or prototype competitive domination orientation multiplies the number of formulaic personalization of individuals. That is any hypostasis inside its Geneon can vary in domination or subdomination of one of the two bases. A model and a prototype become a leading basis for another. In that case the set of formulae increases its number and diversity.

ISW formula can be spelt as I(M)S(M)W(M), it means intellect and dianon dominated model and subdominated prototype, dianon dominated sensus, and dianon dominated will. I(P)S(P)W(P) is the same but with all the hypostases being prototypically dominated. And further without decoding: I(M)S(P)W(M), I(M)S(M)W(P), I(P)S(M)W(M), I(M)S(P)W(P). We can draw a pedagogical graph of individual human Geneons, enabling to build the education process on this basis.

This is our human treasure as well as a material for pedagogy: we deal with an in a way psychological construction of the individual and society as a whole. Hence the pedagogical process should be constructed. Firstly, the purpose of the education system is to create a Geneon for every student to qualitatively fill all three hypostases; secondly, to get them cooperating together in a balanced way. This is the main thing to remember, for this is a major task for pedagogy in the school and university.

Questionnaire test is an instrument to determine the classification of natural thinking of a student, and questionnaires are instruments to determine the thinking of a student. Questionnaire tests aren't directly connected to human psychology as long as psychologists research the motives of human actions whereas well thought-out questionnaires discover the natural patterns of thinking, and they are the tools helping us to determine the natural informational code of human thinking.

Knowing each student's informational code and his thinking development spheres allows a pedagogue to teach them according to their natural capabilities; it will surely improve the quality of education and allow resolving many other tasks in education. Also, it will allow students to find themselves in a professional sphere, and most of all help them understand outward things, work with information, and to become an individuality.

## 6. Conclusions

For increasing quality of educational process we need to create Mind model of every student and formulate optimal learning strategy for this student. This Mind model lets us take care of a student according to a structure of student's mind.

We suggest to build Mind Model (Geneon) during the education process, it's necessary to take care of a student's all educational vertical line. It is natural not to forget about upbringing, for only together they can be called education.

We suggest doing the following work for 10-11 year-old primary school students: Give explanations on the mental performance process to pedagogues. Explain how the world is perceived by the children, how they build this world inside their heads (exactly their own world, through which they interpret the surrounding one). Explain how they perceive themselves in the world. At first, the teacher should learn his Geneon and understand him (questionnaire tests), it will help the teacher to build a curriculum. I suggest the following schedule.

Work with primary school teachers during half a day from 10:00 to 11:30, and in the second half from 12:00 to 13:30. That includes the following: Student reviewing (Geneons), Geneon harmonization task distribution for parents and teachers. Teach themselves as well as the children to build different models (in forms of creative activities, sometimes in a lesson).

Preparing a school-book for the children based primarily on model concept in education.

Review the students' Geneon after the end of each academic year, giving tasks for the summer to harmonize Geneon during the summer holidays.

High (secondary) school: Geneon reviewing begins. Give some energization work according to the hurt hypostasis. This task should be given personally to him and his parents. The teacher shouldn't forget about it during the academic process.

It is desirable to lead the academic process through a model conception in education (we will explain what we mean). Think through the work to harmonize thinking process through the collective mind of a class or two classes simultaneously. This method can be applied during the classes. On completion this work, Geneon reviewing must be held.

The final grades (9th-11th) in High School.

Begin Geneon reviewing of every student and better work through the collective mind, taking only some students individually. When working with the collective mind, you may offer for and analyze fairy tales with secondary students, whereas senior school students should be offered definite problems or reviewing conscious world perception in the concepts like those: What is happiness? What do we live for? What is the school? What is your concept of self education? etc.

Try organizing the education process in a game form. (The methods are thought through for all ages and students. All the methods can be consciously presented). You'll need at least one working day for it. It can be divided for secondary and senior school teachers.

All the methods and everything used will be used and presented. On graduation, we offer giving personal Geneon formulae to every student. It is desirable that both higher education establishments and the senior school initially review their students trying to harmonize their thinking process for them to understand, feel, and be able to do everything. The education process in higher education establishments should be held using the collective mind and helping students discover their Geneon as well as in the primary school.

Our research work in the area shows that a new model of education provides for the designated purposes of education to introduce the definition of critical thinking activity of students. It aims to help teachers to better understand their students and to produce the most impact of their discipline. According to the function of the structure of the "active brain" tests – questionnaires helped to build macrostructure of the reasoning and information code and structure of thinking.

As a result of pedagogical experiment we could see better academic results for all students in a range from 0.8 to 1.2 points.

The paper is concluded with a number of suggestions for further research and, the remark that the progress of any society is always reflected in the extent of development of its educational systems (primary, secondary and higher education).

In the conclusion we would like to add that the main task of the education for today is the education of students to become active members of the future society, while the task of the schools and educational systems in general is to direct such development in a best way possible. Importantly, we would like to stress that the aim of any pedagogical process is the desired final result of education and orientation on the future. This has to be accompanied by all-round development of an individual.

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## CREATING ONLINE COMMUNITY THROUGH E-LEARNING FACULTY MENTORSHIP PROGRAMS

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### Abstract

Research indicates that faculty mentorship provides the needed academic guidance and personal connection that many students desire and require in order to be successful in higher education. Researchers suggest that these mentorship relationships between faculty and students should be based on trust, integrity, and opportunity. The inclusion of faculty mentoring has been described as creating a zone of proximal development in which students are able to receive support based on their current academic skills and needs. The role of faculty mentors goes beyond them simply being an advisor. These individuals provide students a wealth of resources, support, wisdom, guidance, and encouragement. Ultimately, faculty mentors generally provide students with both academic and career guidance as well as psychosocial support. Through these mentorship relationships, students are able to gain self-confidence, develop appropriate goals, and continue to successfully progress through their doctoral programs. Students also receive support that helps them develop and enhance their graduate and professional identities, which can have a significant impact on student persistence. Thus, mentor relationships have been shown to positively impact student retention, student connections and feelings towards their education, dissertation completion and research productivity, and students' potential career advancement. Researchers have also found that students who are more actively involved in their colleges/universities are more likely to graduate.

The research literature specifically documents the positive impacts of faculty and student mentor relationships with first year undergraduate students, first generation students in college, students seeking degrees in the medical professions, minority and female students, and doctoral-level students. While traditional mentoring has generally taken place face-to-face, the growth of online education has created the need for mentoring to take place from a distance, yet to still produce the same supportive results. Particularly, faculty may need to carefully consider how to most effectively develop online mentorship programs that emphasize students' experiences to ensure academic growth and empowerment. The inclusion of these types of programs have become significantly more important in online learning contexts due to the growth and continual popularity of e-learning programs.

This presentation will focus on means of creating and building a constructive faculty and student mentor relationship through the uses of technology and e-learning as a method of creating engagement in students' learning, research interests, and future career success. Additionally, this presentation will provide insight into the development of an online faculty mentorship program and strategies for creating a supportive and engaged community of learners.

**Keywords:** *Faculty Mentor Relationships; Doctoral Faculty Mentorship; E-learning Mentor Relationships.*

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### 1. Introduction

Online education has grown substantially over the last several decades. In 2014, 14% of students were exclusively enrolled in distance education coursework (National Center for Education Statistics, 2014). The Online Learning Consortium (2016) reported that 28% of students are enrolled in a minimum of one online course. This statistic results in approximately one in every four students completing online coursework. Although online courses have gained more student popularity throughout the last decade, student persistence in online classes may be lower than traditional face-to-face courses. Croxton (2014) reported that "rates of students who fail to complete their online courses range from as low as 10% to as high as 50% to 75%" (p. 314). However, Ewing, Mathieson, Alexander, and Leafman (2012) suggested that doctoral programs that maintain continuous communication with students can experience graduate

rates of 73%. In order to ensure students succeed in online programs, institutions may need to provide students additional supports in all aspects of their academic requirements. The development of online mentorship programs may be important for students to gain guidance, feedback, and assistance from their program faculty.

## 2. Faculty Mentorship

Faculty members have many diverse roles and responsibilities related to scholarship, teaching, and student success. This is particularly true of professors who work with doctoral-level students in which a mentorship program may be essential in guiding students through their dissertation research and professional career goals. In academic settings, a student-centered mentorship model is perceived to be a foundational aspect of student development. This model as described by Zipp, Cahill, and Clark (2009) requires that faculty members invest a substantial amount of time mentoring each of their doctoral students.

The role of faculty members may be particularly critical in online programs due to the numerous external, internal, and contextual factors that may impact student retention. For example, Croxton (2014) described external factors as being comprised of family pressures, time constraints, and lack of employer support; internal factors as including students' levels of motivation, self-regulation, and self-efficacy; and contextual factors as encompassing technology difficulties, feelings of loneliness, and lack of instructor presence. However, although mentorship relationships between faculty and students are often perceived as a vital aspect of doctoral programs, Stein and Glazer (2009) proclaimed that faculty members may receive limited preparation and guidance on how to establish these relationships. Stein and Glazer (2009) further expressed that there are additional challenges that faculty may face in the development of these types of relationships in distance learning institutions. Researchers who have conducted studies focused on faculty student mentorships have found that: 1) high quality faculty-student interactions results in lower dropout rates and positively impacts persistence toward degree completion (Kezar & Maxey, 2014), and 2) successful mentors in nursing programs had characteristics that included active listening, sincerity, and a well-established standing in the academic community (Sambunjak, Straus, & Marusic, 2010). The terms supervision, mentoring, and advising are often used interchangeably in the literature, but these types of relationships impact students' emotional, cognitive and career development (Swapna, Johnson, & Hardemon, 2013).

### 2.1. Doctoral Students

Griffiths and Miller (2005) described online mentoring as differing from face-to-face mentoring due to its dependence on time and distance and the nature of online communication. Online mentoring has been described by researchers such as Bierema and Merriam (2002) as a mutually beneficial relationship that occurs between a mentor and mentee and includes a focus on the four areas of learning, modeling, advising, and modeling. Although there is limited research focused on faculty student mentorships in online doctoral programs particularly in the area of academic mentoring relationships between faculty and students (Kumar, Johnson, & Hardemon, 2013), this type of relationship can have a significant impact on student degree completion. Specifically, half of all doctoral students fail to earn their degrees (Holley & Caldwell, 2012) and the inclusion of a mentorship program could be beneficial in achieving higher rates of doctoral student graduation rates. Faculty mentorship is often perceived by doctoral students as being a significant aspect of receiving a high quality education (Carpenter, Makhadmeh, & Thornton, 2015). Indeed, Davidson and Foster-Johnson (2001) stated that "the cultivation of developmental or mentoring relationships between graduate students and their professors is a critical factor in determining the successful completion of graduate programs" (p. 243).

Prior researchers have found that these types of mentor relationships promote self-esteem, competency, and efficacy (Day & Allen, 2004; Kram, 1983) as well as student retention, dissertation completion, and career advancement (Cronan-Hillix, Gensheimer, Cronan-Hillix, 1986; Gardner & Barnes, 2007). However, faculty mentors from diverse disciplines from their students may not be perceived as being effective mentors. For example, Holley (2012) found that some students in her study believed that only faculty members who possessed a similar disciplinary background could provide effective mentoring support. Holley further discovered that the success of a mentorship relationship was often based on the faculty member's availability to meet with the student. Because many online doctoral students often juggle multiple personal, professional, and academic responsibilities, having a mentor who is available to meet in the early evening and weekend hours may also be essential to their success.

## 2.2. Implementation of Online Mentoring Programs

Brill, Balcanoff, Land, Gogarty, and Turner (2014) stated that the absence of effective mentoring in higher education is one of the major reasons that students may lack persistence in their doctoral studies. As such, institutions may need to carefully consider how to implement, maintain, and continuously improve faculty mentor programs that they include within their online programs. Prior to establishing a mentorship program, Johnson (2016) recommended that faculty members first consider and reflect on the graduate student experience. This experience can be considered by students to be stressful yet exciting. Furthermore, new graduate students may often struggle with feelings of inadequateness (imposter syndrome) in which students fear that they are incompetent and faculty may perceive their acceptance into the program as an error (Johnson). Ali and Kohun (2006) also found that students perceive the beginning of their doctoral programs to be somewhat perplexing in which they find program materials confusing and lacking of specific information focused on degree completion requirements. Partnering students with a faculty mentor at the onset of their program could be one effective strategy that helps students understand the program expectations and they can further assist the student in the development of a graduate identity.

Faculty members may also need to be trained on how to be effective mentors. In Linden, Ohlin, and Brodin's (2013) study, they found that a lack of professional development focused on training faculty members to become effective mentors often results in mentor sessions focusing on tasks and roles rather than personalized student learning. Faculty mentors can be taught to acquire different types of program support that they are able to provide to their mentees. West, Gokalp, Pena, Fischer, and Gupton (2011) described these supports as including assistance in networking, psychosocial guidance, and coaching. Additionally, faculty members may also need training on how to work with diverse groups of students since student demographics may impact how they perceive their mentors. For example, researchers who have conducted studies focused on student demographics and mentor relationships have found that older students may be less inclined to receiving mentorship, minority students struggle with mentorship due to the limited number of minority mentors (Holley & Caldwell, 2012), and female students are more likely to seek mentorship relationships with their faculty members (Rose, 2005). As illustrated in these examples, the diverse range of student differences can create unique challenges in the development of an effective online mentorship program. However, Brill et al. (2014) advised that this type of program can be effective when faculty are connected to the institution's mission and embrace high levels of scholarship and when program directors engage in transformational leadership by providing faculty high levels of motivation, resources, and guidance.

When developing a virtual mentorship program, one of the most important factors to consider is how doctoral-level students will be most supported within an online environment. Kumar, Johnson, & Hardemon (2013) suggested that successful online mentoring needs to be flexible and effectively integrate multiple forms of technology that facilitates and promotes doctoral students' levels of learning and autonomy. Furthermore, in Kumar et al.'s (2013) research they discovered that when online mentoring programs are utilized as part of the dissertation process that these interactions can be perceived as being similar to teaching and learning relationships that are found in online settings. Still, faculty mentorship may need to go beyond enhancing students learning and focus on areas such as time management. For example, West et al. (2011) discovered approximately 60% of participants in their study had a difficult time balancing life obligations (e.g., caregiver responsibilities, full time employment) with their academic studies. As a result, mentorship programs may need encompass both academic and professional development skills as well as include a focus on how students are able to balance their daily responsibilities to be inclusive of their academic studies.

## 3. Conclusion

Online programs have been found to be as effective as traditional face-to-face ones (Nguyen, 2015). As such, the popularity of online programs will most likely continue to grow. Therefore, institutions may need to continuously enhance their academic programs to contain appropriate and supportive mentorship programs, which may be a key factor to student success and degree completion. Indeed, Kumar, Johnson, & Hardemon (2013) proclaimed that "the psychosocial aspect of mentoring provides the mentee with the emotional and social support necessary to persist through the demands of academic and professional development, and reflect on personal strengths and weaknesses as he/she develops academically, professional, and personally" (p. 2). Essentially, a major factor in doctoral students' academic success is faculty mentorship. Thus, online programs and institutions need to determine what aspects of faculty mentorship are most essential for their students and the most effective way to implement these types of programs. These experiences provide students a wealth of resources ranging from academic success to future professional development skills. As stated by Brill et al. (2014)

“the student’s experience within the doctoral journey matters to their success” (p. 35). As such, it the responsibility of the institution and program faculty to ensure that students’ feel supported and guided throughout their entire program of studies.

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## CLASSROOM-BASED VALUES EDUCATION IN VIETNAM: IMPLEMENTATION AND ISSUES

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### Abstract

Values education from the whole school approach is examined at three levels including the school level, the classroom level and the community level. At classroom level, values education is enacted and interpreted from general curriculum to specific values-focused lessons and activities for each class community. Values education is also implicit through the teacher-student relationships and teacher modelling. This paper explores how values education is implemented at the classroom level in two upper secondary schools in Vietnam. The study follows a qualitative research design with semi-structured interviews of sixteen teachers and observation of their teaching. The findings focus on the most important values should be taught, implicit and explicit teaching methods and evaluation of values education at the classroom level. It reveals tensions in teaching values and initiatives which teachers used to promote values. The study concludes that it is necessary to select the value - *honesty* to teach in upper secondary schools in Vietnam. Furthermore, new educational strategies should be developed to help teachers regarding values education pedagogy and evaluation.

**Keywords:** *Values education, teacher-student relationships, teacher modelling, curriculum, upper secondary school*

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### 1. Introduction

In recent times, values education is considered as a pedagogy to increase quality teaching and students' wellbeing (Lovat, 2017; Lovat & Clement, 2008; Lovat, Dally, Clement, & Toomey, 2011; Lovat & Toomey, 2007; Lovat, Toomey, Clement, Crotty, & Nielsen, 2009). Values education is implemented implicitly and explicitly through all activities of a school as Halstead (1996) states:

*The values of schools are apparent in their organization, curriculum and discipline procedures, as well as in the relationships between teachers and pupils. Values are reflected in what teachers choose to permit or encourage in the classroom and in the way they respond to children's contributions to learning, and children learn values from such response (p. 2).*

At the classroom level, lessons and activities are held to raise awareness of selected values among students. Moreover, students learn to put these values into practice with the wider society (DeNobile & Hogan, 2014). Values education is presented but invisible through the teacher-student relationships and teacher modelling.

In Vietnam, in addition to the subjects Moral Education and Citizenship Education as two 'main' channels to transfer values in the compulsory curriculum, the educational aims, missions and demands performed in every activity of school are considered as a syllabus of personality and character education (Nguyen, Nguyen, & Mac, 1995). Although values education is an important part in every aspect of Vietnamese school, a clear focus on values education studies seems to be absent. It is necessary to investigate contemporary values education experiences at the classroom level where students and teachers work together and influence each other daily and directly.

The paper attempts to identify the views of teachers in terms of the most important values that should be taught at school, implicit and explicit pedagogies, values education evaluation and difficulties in teaching values.

## 2. Methods

The study utilized a qualitative research design with semi-structured interviews and observations at two upper secondary schools in Vietnam (school A and school B). A total of sixteen teachers were involved and their information is as follows:

Table 1. Teacher participants.

| School A |        |                     | School B |        |                     |
|----------|--------|---------------------|----------|--------|---------------------|
| Teacher  | Sex    | Years of Experience | Teacher  | Sex    | Years of Experience |
| 1        | Female | 10                  | 9        | Male   | 5                   |
| 2        | Female | 5                   | 10       | Female | 4                   |
| 3        | Female | 5                   | 11       | Female | 3                   |
| 4        | Female | 21                  | 12       | Male   | 6                   |
| 5        | Male   | 12                  | 13       | Male   | 5                   |
| 6        | Male   | 5                   | 14       | Male   | 6                   |
| 7        | Male   | 5                   | 15       | Female | 10                  |
| 8        | Female | 5                   | 16       | Female | 9                   |

The teaching of each participant was observed first. Then the participants were interviewed; all interviews were audio-recorded, transcribed and sent back to participants for accuracy checking before being translated into English. Four main themes were developed from the data as follows: the most important values, values education pedagogies, values education evaluation and difficulties in values education. These themes were coded with Nvivo software and quotations were selected to use in the research findings. The data was analyzed and written up descriptively and inductively.

## 3. Findings

### 3.1. The most important values

#### *School A*

Five of eight teachers in school A stated *honesty* as the most important value to transfer and promote at school because they claimed when students were honest, teachers could help to correct their mistakes.

When my students are honest, I can assess them exactly then I can give them feedback and help them (*Teacher 3*).

*I always tell my students on the first day of each school year that you can make mistakes as long as you are honest and try to correct them. I am here to help you. (Teacher 6).*

Teacher 5 claimed *honesty* was the most significant value taught in school in relevance to issues of exam cheating in Vietnam. As a consequence of high expectations of parents and teachers, students had no choice but to achieve good results. However not all students could attain these good learning levels and felt they had to cheat. Together with *honesty*, values such as *respect*, *self-esteem*, *diligence*, *creativity* and *tolerance* were values that teachers believed should be taught at school.

#### *School B*

Similar results were identified in school B. When four of five teachers were asked about the most important values to teach at school, they mentioned *honesty*.

*Honesty is a basic value of an individual. If a person is not honest, other values become virtual (teacher 14).*

*Honesty helps communication at school become easier (teacher 9).*

Teacher 10 also stated that *honesty* should be selected to teach at school because doing so could reduce exam cheating problems because when students were honest, they would respect knowledge, science and research. Both teachers in school A and B also mentioned *respect* and *creativity* as other important values. In school B, different important values were discussed such as *politeness*, *confidence* and Vietnamese traditional values.

### 3.2. Pedagogies

Teaching values is different from teaching knowledge of specific subjects and emphasizes not only developing cognitive levels of students but also behavioural and affective levels. Values can be learnt through direct methods implemented consciously by teachers, and by hidden methods instilling values naturally without any explicit purpose of teachers and students.

**3.2.1. The explicit methods.** In both schools, teachers used a variety of explicit methods to teach values from traditional ways such as questioning, storytelling and discussion to more modern ways with support of videos, games and visual objects. However, when teaching values, most teachers combined this into their lessons. Some teachers focused on students' cooperation, tolerance and respect by guiding them on how to work as a team.

*I often assign a topic and instruct them to work together (Teacher 12).*

*The students have to plan their project and divide detailed tasks to each other. Then they will present it in class and receive comments from their mates and teachers...That's the way they learn to listen to their friends' ideas patiently and the way to cooperate with each other... (Teacher 2).*

Teacher 1 proposed she often used good examples to teach her students. Teacher 4 claimed using good examples to teach values is effective because the students did not want to be preached at; they wanted to hear others' stories which applied for their situation. Teacher 10 mentioned reading good books was an effective way to teach values.

In school A, some teachers stated that they often used rebuke and punishment with their students when talking gently did not bring results.

*In some cases, I had to request my students to stand up and asked them about their wrong behaviours and attitudes... (Teacher 5).*

*I invited noisy students to stand up at the end of the classroom to avoid minding other students (Teacher 3).*

*With some cases, I had to use strong methods like scolding and discipline (Teacher 2).*

**3.2.2. The implicit methods. a. Good relationships between students and teachers**

Values are reflected in the relationships between teachers and students in school (Halstead, 1996) whether the involved people perceive this or not. In both schools, all teachers agreed that the relationship between teachers and students could influence their teaching and learning in negative and positive ways.

*If students like you, they also enjoy learning your subject and willing to cooperate with you. Otherwise when you ask them, they do not answer or even offend you... (Teacher 3).*

*We should have good relationships with most of students in a class. If not, we fail to teach them (Teacher 14).*

Understanding that the relationships between teachers and students impacted on the efficiency of teaching and learning, some teachers tried to impress their students by their teaching.

*I always burn myself with the love of teaching... I do not forget to encourage by rewarding small gifts suchlike happy stickers and books (Teacher 1).*

*When students understand that their teachers are doing with great efforts to bring the good things, students will love them (Teacher 7).*

Some teachers tried to be good friends with their students and played with them at break and after school time.

*I often play some games with my students at school playground (Teacher 11).*

*I am playing in a football team with my students (Teacher 12).*

In the classroom, some teachers made a conscious effort at creating friendly and relaxed ambience during their teaching periods to improve learning quality.

*Honestly I am bad at singing, but when I find my students stressful, I try to sing and dance (Teacher 6).*

*When I find that my students are tired of learning, I often tell jokes to make them laugh (teacher 10).*

However, in both schools, some teachers said that teachers should not have close relationships with students because they were afraid that students would not respect and listen to them if they did so.

*I think we should keep a certain distance with our students (Teacher 7).*

*Teachers should remind students about their positions. We are not their peers or mates (Teacher 16).*

**b. Modelling by teachers**

Values education can be achieved through modelling by teachers who have direct influence on their students. From the views of teacher participants, students followed the teachers who they admired, especially their head teachers. Being a teacher, meant that they had a responsibility to be a good person, both at school and in society.

*When we observe the styles of head teachers, we will see the students of their head classes copy these styles...For instance, a class has an active head teacher, that class will take part in many activities and vice versa... (Teacher 3).*

*I think, every teacher should be good at morality and behaviour. If we just do one mistake, reputation of educational sector can be impacted (Teacher 8).*

Teacher 10 claimed that the best pedagogy of teaching values was teacher modelling through teachers' language, communication and behaviour. The positive character of teachers might impact students directly however, when teachers behaved badly, students were affected indirectly and they did not show respect to their teachers. Teachers should unite in what they said and what they did. If not, they could make students confused or even offended.

*Some teachers did not keep their word. What they said and what they did differently. As a result, their student did not cooperate with them (Teacher 11).*

*If a teacher does something wrong, their students can do the same things (Teacher 9)*

### 3.3. Evaluation

In the Vietnamese educational system secondary schools assess knowledge and skills of students through their learning capacity based on a marking system from 0 to 10, equivalent to lowest to highest levels. The learning capacity of students is assessed on the outcome of many tests performed weekly and monthly. Each school year has two terms and at the end of each term student results are released. Together with learning capacity assessment, a school also issues records of conduct ranking with four levels namely Good Conduct level, Fairly Good Conduct level, Medium Conduct level and Bad Conduct level. According to teachers of school A, values education assessment was conduct ranking based on the times and frequencies of breaking the school rules, and progress of students in terms of improving bad behaviour throughout the whole school year.

*I connect closely with the Supervisory Group to record my student's mistakes then I assess conduct level of each student at the end of each term... (Teacher 1).*

*The criteria to assess conduct level lies on how the students obey of the school rules and their progress by reducing mistakes... (Teacher 2).*

In school B, teachers stated that they did not have any specific method of assessment regarding values education for their students.

*It is so hard to know the results of values education. We just observe our students' behaviours and attitude (Teacher 13).*

*The assessment of values education is quite subjectively so it is not exact (Teacher 12).*

### 3.4. Difficulties in values education

In both schools, teacher participants claimed the lack of time caused difficulties for values education.

*I wish I had more time for values education (Teacher 6).*

*We just focus on teaching maths, we do not have time for values education (Teacher 13).*

In school A, teacher 6 proposed the lack of time for values education was a result of the many students in a class. In school B, teacher 12 explained that teachers had to take all time for subject content teaching. Other significant trouble in teaching values came from the lack of cooperation of students' families.

*Some students behaved badly. I invited their parents to school and they did not believe in what I said... They thought I made up the stories because their children were nice and obedient at home (Teacher 5).*

*Some parents always rebuke their children without listening. The children become stubborn gradually (Teacher 2).*

## 4. Conclusion

The findings revealed that in both schools the majority of participants mentioned *honesty* as the most important value that should be taught. The explanation for choosing *honesty* was similar in both schools in relevance to exam cheating issues in Vietnam and the true quality of students' abilities in assessment. This suggests that any educational strategies to promote values education in school cannot exclude *honesty* in the curriculum and that the exam cheating problems should be the focus of specific study in the future.

Teacher participant stated many different methods to teach values, however, they mentioned that they enacted values education accidentally without any purpose and preparation in advance. Some teachers claimed they often used rebuke and punishment. This indicates the need to develop values education programs not only for students but also for teachers regarding appropriate pedagogies for values education.

In terms of the relationship between teacher and student, although the majority of teachers were aware of making good relationships with their students and they were willing to become their students' friends, some of them thought students might not respect them if they were too close. At this point, students' opinions should be sought to explore their expectations in the relationships with teachers. Teacher modelling could influence students in both positive and negative ways and being good mirrors for students was regarded as the best way to teach values.

The assessment of values education based on the number of times of school rules were broken seems unsatisfactory. The evaluation should be underpinned by a unified curriculum in which the content and pedagogies are well-developed first and followed with values education assessment. The lack of time for values education was a cause for large concern as most of the time was used for transferring knowledge of subjects. It requires changes on a national scale for the curriculum of the Vietnamese educational system.

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## EDUCATIONAL PROFESSIONALISM AND TRAINING OF SECONDARY EDUCATION TEACHERS

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### Abstract

The training of secondary school teachers in Spain has suffered a substantial change since 2006 when the Spanish Organic Law on Education promoted the creation of the Master's Degree in Secondary Education and Vocational Education and Teaching of Languages (MAES) as a necessary requirement for teaching at this stage of education. As a consequence, the configuration of current curricula is at the center of the criticism of the educational community and hence, this work tries to deepen an essential factor linked to the training of future teachers as is the configuration, as well as the development of their professionalism and teaching identity.

This work is part of a study carried out with 198 students from MAES of the University of Seville (Spain) and is structured based on a mixed methodological design. Through a brief semi-structured survey, composed of 5 multiple-choice items and 1 open-ended item, the students' opinions are more deeply related to factors that, linked to initial training, contribute to the development and achievement of a process of constructing the significant teaching identity, while also exploring the interest in teaching and the relevance of the teaching vocation.

The results obtained place us at a starting point in which 89.9% is clearly positioned in the line of having a clear interest in teaching in the secondary stage. Since then, a large majority of students (70.1%) maintain that although vocation is an essential quality for the exercise of the teaching profession, this is not achieved in pedagogical training courses. On the other hand, the factors that contribute to the significant configuration of this teaching identity, are included in three main focuses of action: teachers (need for a motivated and experienced teacher), curricular planning (period of more extensive professional practices, subjects Associated with didactics or psychology) and didactic methodology (use of active methodologies, work with real cases, promotion of communicative skills and competences, motivation, conflict resolution in the classroom, etc.).

In short, the students focus on three key areas to be revitalized by the institutions, to avoid that the current initial training of secondary school teachers is committed to a course of initiation to secondary education empty of meaning.

**Keywords:** *Teacher Education Programs, Secondary School Teachers, Vocational Education Teachers, Professional Identity, Professional Development.*

### 1. Introduction

In Spain, the initial training of future secondary school teachers is characterized by having undergone a major transformation with the arrival of the European Higher Education Area and the approval in 2006 of the Organic Law on Education. The main novelty has to do with the replacement of the Pedagogical Aptitude Course by the current Master's Degree in Compulsory Secondary Education and Baccalaureate, Vocational Training and Teaching of Languages, as a necessary requirement to be able to teach at this stage of education through a specific didactic-pedagogical training (Tiana, 2009; Manso & Martín, 2014). It seeks to go beyond the creation of experts in a disciplinary field.

The objective of investigating the initial formation of secondary school teachers, since the mid-1990s, has come to know not only what the needs are, but also to show the students' beliefs, attitudes, motivations, thoughts or expectations, with the aim of improving, from an integral perspective, the process of qualification and professional identity (Bolívar, 2007; González Sanmamed, 2009; Pontes & Serrano, 2010; Manso & Martín, 2014). Thus, in the scientific literature, there are studies like those of Pontes & Serrano (2008) or Sánchez Lissen (2009) that show the impact that certain motivations (salary,

vacation, etc.) exert on the student's consideration of the teaching profession, but also warns of the need to understand the configuration of professional identity as "a construction composed at the same time of adherence to professional models, the result of a continuous biographical process and relational processes" (Bolívar, Fernández & Molina, 2005, p.4).

In order to take into account the importance of the process of configuring professional identity during the initial training period of the future secondary school teachers, this paper aims to reveal what factors must be taken into account to contribute to the development of a positive vision for the teaching profession, and for this it joins with other existing (Buendía et al., 2011; Day, 2005; Fuentes, García & Martínez, 2009; Korthagen, Loughran & Russell, 2006; Marcelo, 2009; Serrano & Pontes, 2015; Solís, Martín, Rivero & Porlán, 2013), in which they reveal "the complexity of the teaching profession and a good initial formation for its exercise; Mastery of communication techniques; The evaluation of training on specific didactics and teaching practices that training in psycho-pedagogical aspects of a general nature; The importance of the tutorial function", as variables to take into account in this process.

## 2. Methods

It is a case study that adopts a research approach mixed and descriptive.

### 2.1. Participants

The study has as reference population the students who are enrolled in the Master's Degree at the University of Seville (Spain) during the 2016-2017 academic year; However, a random sampling is carried out, selecting a total of 199 students (50% of the population) who will be the final sample of informants. Age ranges between the following ranges: less than 25 years (46.2%); Between 25 and 30 years (31.1%); Between 30 and 35 years (11%); Between 35 and 40 years (6.53%) and over 40 (5%). Of these, 63.8% were women and 36.2% were men.

### 2.2. Procedure and collection of information

To obtain information, a brief semi-structured survey composed of 6 items has been created and developed from Serrano & Pontes (2015); Pontes, Ariza & Del Rey (2010); Serrano (2013); Molina & Esteve (2016) & Díaz, Alfageme & Serrano (2013) studies. The first five items allow a response from four possible options and are intended to investigate intrinsic and extrinsic factors that affect variables related to the development of teacher identity, Such as interest, vocation and professional motivation for the development of the teaching career; For its part, the sixth item corresponds to an open-ended question in which respondents are urged to give their opinion on the factors that, linked to initial formation, are believed to contribute to the development of a process of identity construction of meaningful teacher identity.

The process of collecting information is developed through the tool "forms" of google and proceeds to the distribution of the survey anonymously. After obtaining the information, the data belonging to the quantitative dimension (5 initial items) are analyzed through SPSS software (version 21) to obtain basic descriptive statistics (frequencies), While textual information and qualitative nature (obtained from the open-ended question) is analyzed through a categorical system that emerges inductively and is designed through the Atlas program. Ti (version 6) (see Table 1).

Table 1. Categorical system.

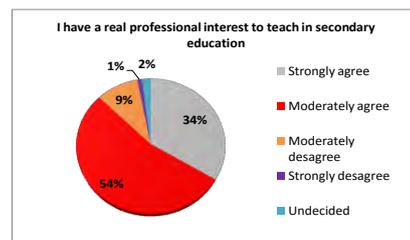
|                             | <i>Dimensions</i>          | <i>Analysis Units</i>               |
|-----------------------------|----------------------------|-------------------------------------|
| <i>Initial training</i>     | <i>Professors</i>          | <i>Personal characteristics</i>     |
|                             |                            | <i>Professional characteristics</i> |
|                             | <i>Curricular planning</i> | <i>Subjects</i>                     |
|                             |                            | <i>Practice period</i>              |
| <i>Didactic methodology</i> | <i>Positive Strategies</i> |                                     |

## 3. Results

This section shows the results obtained in the different items. First, the items associated with multiple-choice questions are presented.

Focusing on intrinsic factors that may influence motivation and interest in teaching, the vast majority of students (88%) indicate that they are positively predisposed and have a vocation to play the teaching profession in the future (Figure 1).

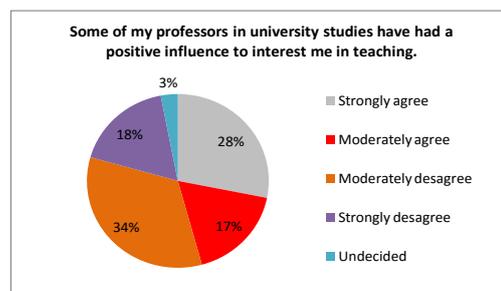
Figure 1. Interest in teaching.



However, 55% of the students acknowledge that this interest in the teaching profession does not arise at the beginning of university studies (compared to 43%), for this reason, it is possible to assume that the professional vocation has been developing as the years pass and intercede some other extrinsic factors.

In relation to these extrinsic factors, when asked about the specific incidence of some of them, as is the case of teachers, we observe that 45% of the sample does recognize that during their university education, their teachers have been positive influences to generate in them the pleasure of teaching. While only 18% acknowledge that their professors have not been positive stimuli (Figure 2).

Figure 2. Influence of professors.



When asked about the incidence of family history or people close to them who positively value the teaching profession, we highlight that 60% acknowledge that they do not receive this type of external stimulus, while 40% do say that somehow these factors have motivated their vocation for teaching.

These previous stimuli have a direct correlation with the last factor we are asking about, which has to do with the material work conditions (more favorable) offered by the teaching profession (stability, holidays, etc.); In particular, the data reveal that 45% acknowledge that they are interested in teaching exclusively because of those conditions compared to 54% who do not have that opinion.

Second, by following the units of analysis of the categorical system, the results associated with the open response item are synthesized and in which it is urged to indicate the factors or aspects that can contribute most to developing the professionalism of teachers during the process of initial teacher training. In the following tables the objective results are presented in decreasing order by the frequency of the evidence.

Regarding the personal and professional characteristics of the teaching staff who teach in the initial formation, the informants point out the following factors to take into account (Table 2):

Table 2. Professors.

| <i>Personal characteristics</i>  | <i>Professional characteristics</i>  |
|--|--|
| <ul style="list-style-type: none"> <li>- Have a sense of humor</li> <li>- Treat students with respect</li> <li>- Be responsible with your work</li> <li>- Be motivated</li> <li>- To have a vocation</li> <li>- Be nice</li> <li>- Show interest for students</li> </ul> | <ul style="list-style-type: none"> <li>- Teaching staff active in secondary education</li> <li>- Professionalism (good teachers)</li> <li>- Competent in transmitting knowledge</li> <li>- Knowledge of new teaching methods</li> <li>- Pedagogical ability</li> <li>- Innovative</li> </ul> |

On the other hand, curricular planning also emerges as one of the main concerns collected among the opinions of the students and specifically affect two factors (Table 3):

Table 3. Curricular planning.

| <i>Subjects</i>  | <i>Practice period</i>   |
|--|--|
| <ul style="list-style-type: none"> <li>– Apply knowledge adapted to the secondary classrooms.</li> <li>– Develop content more practical than theoretical</li> <li>– Working knowledge of psychology and didactics</li> <li>– Provide content related to current concerns in secondary (Educational needs, conflict resolution)</li> <li>– Better scheduling for each subject</li> <li>– Promote transversality</li> <li>– Address other content of interest (design of didactic units, emotional intelligence, oratory, etc.)</li> </ul> | <ul style="list-style-type: none"> <li>– Increase the number of hours of practice in Secondary Education.</li> <li>– Make a better time programming for external practices.</li> <li>– Improve tutoring in high schools</li> </ul> |

Finally, in relation to the methodology from which professional development is built as future teachers, students detect the following needs (table 4):

Table 4. The methodology.

| <i>Positive Strategies</i>  |
|---|
| <ul style="list-style-type: none"> <li>– The study of real cases (case method)</li> <li>– Interaction with active secondary school teachers.</li> <li>– Techniques for effective communication and management of the secondary classroom.</li> <li>– Identify the centers of interest and promote reflection</li> <li>– Active methodologies (cooperative work, project work, etc.)</li> <li>– Use role-playing to improve social and personal skills.</li> </ul> |

#### 4. Discussion and Conclusions

The results obtained on interest and motivation for the teaching profession corroborate the data obtained in previous studies (Pérez et al., 2007; Pontes & Serrano, 2008; Pontes et al., 2010). In both cases, the vocation and the pragmatic nature emerge as determining factors for the choice of a profession in which the incidence of external factors such as family or close associates with a positive vision of teaching have less relevance than contact With professors admired and from whom positive notions are learned to acquire a vocation for this profession (Pontes et al, 2010).

Likewise, when the elements that can contribute to optimal teacher professional development are addressed, the results coincide with those obtained in other studies (Manso & Martin 2014; Pérez et al., 2007; Molina & Esteve, 2016), in pointing out the need for training linked to subjects from which psychopedagogical, psychological, didactic and above all practical knowledge; all guided by a methodology that allows constant interaction with reality (needs and interests in the current secondary education), with innovation (especially technology) and the interests of the students themselves (Hernández & Maquilón, 2010).

Special attention is drawn to the importance given to the period of professional practice and to practical activity in the classroom, as opposed to theoretical content; This is what Vaillant (2007) identifies as a first identity crisis (the disciplinary and didactic pedagogical formation conflict) in the initial formation.

Finally, this study draws the interest of sharing results from research of a similar purpose, since the initial training of future secondary school teachers needs the voice of their protagonists to take the appropriate measures regarding the configuration of motivated, interested and satisfied professionals, but above all, identified with the profession they have accessed and will play in the future.

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# INVESTIGATING THE RELATIONSHIP BETWEEN THE READING COMPREHENSION LEVEL AND WORD PROBLEM ANALYSIS BY LIFE SCIENCES STUDENT TEACHERS AT A UNIVERSITY OF TECHNOLOGY

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## Abstract

This study aimed to investigate the relationship between reading comprehension level and word problem analysis skill of Life Sciences Student Teachers at a university of technology through a correlational design. Convenience sampling was used. Data were collected from a convenient sample of fifty (50) life sciences student teachers using a questionnaire comprising fifteen (15) questions comprising Life Sciences Genetics word problems and the Scholastic Reading Inventory (SRI). The results revealed a Cronbach's alpha value of 0.87 which is interpreted as excellent. Furthermore, the research results revealed that 36% of the respondents are below basic and 14% are advanced readers. Findings also revealed that 50% of the respondents have a word problem analysis skill that is equal to their level of study. A Pearson-r formula giving a coefficient of 0.376 was utilized to correlate the two variables. Based on the results, there is a low positive correlation between reading comprehension and word problem analysis. A regression analysis conducted to determine a simple relationship between the two variables showed that there was an average increase of 0.53 points per 100 point-lexile increase from a standard average score of 7.45 out of 15 items; which implies that reading comprehension minimally affects the word problem analysis of the students.

*Keywords: Word problem, reading comprehension.*

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## 1. Introduction

Reading is a skill which is applied in everything that one does in everyday life and needs to be nurtured. A student with have a high comprehension level has an advantage for easily understanding sequence of directions and sentences. In the study of the language skills of bilinguals, Commins (1979) asserts that a certain level of linguistic proficiency seemed to be necessary for academic achievement. Word problems can be answered correctly as long as the analyses of the given problems are correct. Moreover, the learner should have verbal ability and language skill to read and understand the problem (James and Alwan, 2011; Xin, Lin, Zhang and Yan, 2007). Thus, comprehension level plays a vital role in solving word problems. Reading comprehension tests how students combine their new knowledge with their already created schemas. Much of the after reading stage focuses on the skills the readers dynamically employ to comprehend a reading, thus, building their own interpretations of new information (Commins, 1979; James and Alwan, 2011).

According to Piaget's Constructivism Theory, through processes of accommodation and assimilation, individuals construct new knowledge from their experiences (Vega and Prieto, 2012; Sanchez and Loreda, 2009; Boonen, Jolles and Schoot, 2016). Much of the reading stage focuses on the skills which the readers employ to comprehend a reading - building their own interpretations of new information. It tests how students combine their new knowledge with their already created schemas (Sanchez and Loreda, 2009; Vygotsky, 1978). Much of the after reading stage focuses on the skills the readers dynamically employ to comprehend a reading, building their own interpretations of new information.

Word problems are usually in paragraph form; therefore comprehension level constitutes the analysis of the word problem. Learners need to have verbal ability and language skill to read and understand the problem (James and Alwan, 2011.) Thus, comprehension level plays a vital role in solving word problems. Learners with reading difficulty in most cases find it impossible to follow a lesson.

## 2. Aim of the study

This study aims to determine the existing the relationship between the reading comprehension level and the ability to analyze word problems amongst Life Sciences student teachers at a university of technology

The study sought to answer the following questions:

- What is the reading comprehension level of the Life Sciences student teachers?
- Are the respondents able to analyze word problems assigned?
- Is there a relationship between the respondent's reading comprehension skill and their ability to analyze word problem?

## 3. Methodology

### 3.1. Research design

This is an exploratory case study.

### 3.2. Participants

The sample comprised 50 Life Sciences pre-service teachers/ student teachers (in third year) enrolled for an undergraduate degree in Life Sciences at an Institution of Higher Learning in South Africa. There were 21 (42%) males and 29 (58%) females.

### 3.3. Instruments

Data were collected using the Scholastic Reading Inventory (SRI); a computer program that quantifies the reading comprehension level of the students to test the comprehension level of participants of the study. A questionnaire comprising fifteen Genetics word problems which focused on the student's ability to analyze word problems was also used.

### 3.4. Data analysis

Descriptive and inferential statistics were generated from the data.

## 4. Results

Below is a table reflecting the reading comprehension level of participants of the study classified into four levels, namely, advanced, proficient, basic, and below basic.

*Table 1. Reading Comprehension Level Scholastic Reading Inventory (SRI) (N= 50).*

| Reading Comprehension Level                        | Advanced          | Proficient     | Basic             | Below Basic           |
|--|-------------------|----------------|-------------------|-----------------------|
| Number of Respondents                              | 7                 | 12             | 13                | 18                    |
| Range of Lexile Scores                             | 1050 and above    | 850 to 1049    | 550 to 849        | 549 and below         |
| Intervention Level (Based on Performance Standard) | Above Grade Level | On Grade Level | Below Grade Level | Far Below Grade Level |
| Average Lexile Score (Respondents)                 | 1135              | 937            | 670               | 362                   |

As reflected on table 1, Seven of the respondents fall under the advanced level, a score equal or greater than to 1100 implies that the respondent has an exceptional reading comprehension; twelve fall under this level with an average lexile score 1135. The respondent is said to be proficient if he/she got a score ranging from 850 to 1099. This implies that the respondent has an average reading comprehension; and twelve (12) respondents involved in this study fall under this level with an average lexile score of 899. Respondents who got a lexile score of 550 to 849 are thirteen (13) and they are basic readers with the

lexile score of 670. This indicates that these respondents' reading level deviates minimally from their expected level. The results also revealed that eighteen (18) of the respondents fall under the below basic level which mean that the respondent's reading level is far below from their expected level. The respondents average lexile score on the below basic group is 362.

The respondents were assigned fifteen (15) Genetics word problems to solve to assess their word problem analysis. Table 2 below shows the frequency of the students under each stanine score with its corresponding intervention level.

Table 2. Word Problem Analysis skill (N= 50).

| Levels of WPA | Intervention Level | Stanine - WPA | Frequency | Percentage |
|---------------|--------------------|---------------|-----------|------------|
| Below Basic   | Very Poor          | 1             | -         | 0 %        |
|               | Poor               | 2             | 5         | 10 %       |
| Basic         | Nearly Poor        | 3             | 7         | 14%        |
|               | Low Average        | 4             | 8         | 16 %       |
| Proficient    | Average            | 5             | 14        | 28 %       |
|               | High Average       | 6             | 5         | 10 %       |
| Advanced      | Above High Average | 7             | 6         | 12 %       |
|               | Nearly Superior    | 8             | 5         | 10 %       |
|               | Superior           | 9             | 2         | 4%         |

The Stanines 7, 8, and 9 constitutes the advanced level of problem solving making up 13 (26%) of the respondents. Respondents at this level can apply different approaches in analyzing problem solving. Respondents at Stanines 5 and 6 can critically think on the best way to solve word problems, 22 (44%) of the respondents belong at this level. Stanines 3 and 4 makes up the basic level of word problem analysis and 15 (30%) belong to this level. At this level, the students can only integrate the givens in a certain word problem without the using critical thinking; they are only at the interpretative level of the Bloom's Levels of Comprehension. Under Stanines 1, and 2 which is categorized as the least level of word problem analysis, the below basic, 5 (10%) of participants fall here. At this level, the respondents can only literally translate expressions or even mimics what is exactly written on the word problem, the basic of Bloom's Levels of Comprehension.

When correlating the Lexile Scores and Word Problem Analysis using Pearson Product-Moment Correlation Coefficient, this resulted in an  $r$  – value of 0.376 which is greater than the  $r$  – critical value 0.138. This denotes a significant relationship between the reading comprehension and word problem skill. The results prove that there is a relationship between reading comprehension skill and word problem analysis skill and thus, language skill and word problem analysis are related (James and Alwan, 2011; Boonen, Jolles and Schoot, 2016).

## 5. Conclusion

The results of the study revealed that most students fall under below basic level and signifies that most of them need more reading comprehension development. Lecturers need to put more emphasis on higher order thinking skills of the students and utilize good art of questioning when teaching the learners to improve their comprehension. Furthermore, make use of creative reading activities and graphic organizers to enhance on the students' comprehension.

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## VIDEOS, EDUCATIONAL ROBOTICS AND PUPPETS: AN EXPERIMENTAL INTEGRATION OF LANGUAGES

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### Abstract

This paper aims to present the results of an experimental activity in Media Education and Educational Robotics, based on the integration of the audiovisual language (video), the Robotics language (LOGO) and the ancient theatrical language of marionettes (puppets of the Italian Dynasty of the Lupi Family). This case study is part of a wide research about the role of the multimedia language and innovation in Education, Pedagogy and Anthropology of Media.

Our research group works following two experimental directions: first, we consider Media Education as a method to teach the grammar and syntax of the multimedia language, to help students not only to read with media but also to write (they can participate in the collective creation of materials for the increase of the cognitive surplus). Of course, we want to educate them to communicate and produce meanings. They should acquire technological skills and digital competences, and overcome some learning difficulties. Secondly, we use educational robotics to increase some basic notions about the visual and spatial skills (above all, in primary schools) and to help students acquire some processes of reasoning, such as the logic of problem solving and creative problem solving. At the same time, we want to help students develop a comparative awareness between the ancient and traditional language of the theatrical puppets and the modern video language and the robot language.

Starting from these aspects and from previous technological and media laboratories (with primary and secondary school students), we experiment with an innovative methodological approach to realize storytelling videos with robots and puppets. In this activity, students create some short films, starting from their imagination and working on the storytelling process; robots (Bee-bot and Pro-bot) and marionettes are the protagonists of these videos. Students must ideate the tale (which is about a comparison between the traditional age and the postmodern-technological age), build the scenography, programme the robots and realize the video, thinking about how robots can move and interact with others and with space, according to the script. In this way, students must consider the skills to realize a communicative video and, at the same time, the code requirements to move a robot as well as how it is possible to create a meaningful product with these technologies. In this paper, we describe this experiment, its educative aims and its results (obtained during the 3rd edition of the Summer Junior University, 2016, Turin, Italy). R. Grimaldi and S. Palmieri wrote 1 and 4 paragraphs; L. Denicolai wrote 2 and 3.

**Keywords:** *Audio-visual Language, Educational Robotics, Theatrical language, Innovation, Media Education.*

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### 1. Introduction. A Theoretical Guide to Robotics

The social complexity of our age requires us to develop conscious approaches to better address the increasingly difficult demands of the technological world. Among the various challenges that this condition poses, education is certainly important. In fact, educational and training institutions should train young people to anticipate the future (Grimaldi, Palmieri, 2016), that is, to feel ready to be the protagonists of tomorrow's world. Based on the assumption that in the presence of an appropriate logical-formal construct it is possible to *imagine the future* (Denicolai et al., 2017), over the last few years we have structured an *Educational Robotics Laboratory* (conceived and directed By Renato Grimaldi, at the Department of Philosophy and Education Sciences, University of Turin), with which we carry out a research and experimentation project, both in academia and in regional schools. The aim is to promote a humanistic and technological-scientific education to help the young acquire useful skills.

The use of educational robotics allows the student to transfer the cognitive process that has led him to write a program with a formal language into a robot's body and motion; some neuroscientific studies also show that this operation enhances the acquisition of knowledge as it can activate mirror neurons (Rizzolatti, Sinigaglia, 2006, Rivoltella, 2012, Grimaldi, 2015). The artifact consisting of the robot and the surrounding world also obliges the student to work in terms of skills as required by new school curricula; in particular, our activity with educational robotics has the following aims:

- Strengthen analytical and synthetic skills;
- Acquire a first computer language;
- Switch from project to realization;
- Stimulate hypothetical thinking and problem-solving skills;
- Encourage divergent thinking;
- Foster communication and relationships between peers;
- Foster basic cognitive and social skills.

At our educational robotics lab, we experienced the effective use of some mini robots, particularly BeeBot with primary school pupils and ProBot with secondary school pupils. While BeeBot moves 15-centimeters back and forth and rotates by 90 degrees, left or right (in the latest version, called BlueBot, it is also programmable via smartphone, has the "repeat" command and can also rotate by 45°), ProBot incorporates the Logo language and – like Papert's turtle<sup>1</sup> – can leave a trace on a white sheet and thus draw geometric figures or different paths (Denicolai, *et al.* 2017).

## 2. Audio-visual Language, Robotics and Puppets

In addition to the integration between audio-visual and programming languages (as in our other proposals (2015, 2016b), the activity we present includes a *dialectical* exchange between mini-robots and some puppets belonging to Daniele Lupi, the last representative of one of the oldest families of puppeteers. The experimentation took place during the Summer Junior University 2016, organized by the City of Turin (Department of Educational Services). During the event, groups of secondary school students (for a total of about 250) were able to get in touch with some laboratories and experimentations of the Turin Universities, thus approaching the world of research. In this context, the Educational Robotics Laboratory has proposed the realization of short films with mini-robots (Denicolai, *et al.* 2015, 2016, 2016b). In the specific case, as mentioned, in addition to the usual video editing, we asked the students involved to create a multimedia product where different media generations (puppets and robots) could interact with each other. The main aim was to work on a continuous *translation* of language codes, encouraging a more conscious acquisition of theoretical-practical skills in the use and design of a technological and communicative artifact.

Our starting intuition to develop this particular dialogue was to combine coding and robotics programming with basic school skills, with particular reference to the issue of information and communication languages, of which the audiovisual is one of the most effective options. Faced with the increasing need to provide students with media education geared to the production - and not just the critical reading - of media texts (often resulting from an attitude of passive use), writing and speaking with technology media (Denicolai, *et al.*, 2016, Denicolai e Parola, 2017) becomes a fundamental strategy to address today's social complexity and develop a voice in the media communication system (Jenkins, 2010, Ito, *et al.* 2009), favouring a conscious and active participation. Reflecting on some interdisciplinary lines of research, such as Zeki's neuroscientific one (2007), as well as those inherent in a probable correlation between the cinematographic image and mirror neurons (Gallese e Guerra, 2015, Hasson, 2008), we chose to focus on the audiovisual language as a synthesis of a potential - and complex - semiological generation system. Writing with the media also means knowing and understanding how to use the rhetorical power of the image (both the iconic image and moving pictures), thus practicing how to compose a sentence and how to orient it from the semiological point of view. In a word, it is important to be familiar with the fundamental tools of the audiovisual medium, thus distinguishing a lexicon, grammar and syntax and trying to practice the typical understanding of rhetorics, which recent lines of study have proposed in a more congenial re-reading (for today's type of communication), namely Digital Rhetoric (Eyman, 2015). Knowing how to make videos thus means, in this perspective, learning to translate a

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<sup>1</sup>The Logo language was designed in the 1960s by Seymour Papert, professor at the prestigious Massachusetts Institute of Technology (MIT), by taking up the symbolic calculation of Lisp, the language of choice for artificial intelligence. It allows for a constructive didactic approach and, by moving - through software commands - a cursor called turtle (originally moving a robot with a turtle-shaped shell), it allows younger pupils (primary school) to enhance their knowledge of temporal relation concepts that underlie skill acquisition, while helping older pupils acquire knowledge of geometry and especially of coding.

thought (and a text) into images and to syntactically order the latter through a continuous verification of the causal relationship between them, that is, between the different scenes; in this way, it is also possible to understand, for example, the importance of editing in the audiovisual field and, above all, to re-read it in a formative key (as well as other production phases, as will be explained in the next paragraph). We have therefore begun to integrate the movements of mini-robots with video frameworks, thereby creating a sort of new digital storytelling, which could be called robot storytelling, with which students have the opportunity to work on creating a story that has robots as its protagonists.

The integration of audiovisual language into robotics programming has allowed us to emphasize the importance of practicing a computer-based education, highlighting, at the same time, how the latter is now an indispensable aspect for our daily work with technology, but also in general, how important it is to our logic and our thinking models. Linguistic integration is therefore aimed at stimulating students to adopt a procedural approach to every type of activity they have to engage in (from digital to everyday activities, even outside of educational and computational contexts). From this point of view, the integration between the audio-visual language and robotics seems to also refer to the concept expressed by Wing, according to which the computational language introduces different levels of abstraction: “In computing, we work simultaneously with a least two, usually more, layers of abstraction: the layer of interest and the layer below; the layer of interest and the layer above [...]. In working with layers of abstraction, we necessarily keep in mind the relationship between each pair of layers, be it defined via an abstraction function, a simulation relation, a transformation or a more general kind of mapping [...]. And so the nuts and bolts in computational thinking are defining abstractions, working with multiple layers of abstraction and understanding the relationships among the different layers. Abstractions are the ‘mental’ tools of computing” (2008, 3718). The creation of short films featuring robots as actors-protagonists of the narrative can also work on multiple levels of abstraction, aiming at the creation of a complex narrative and communicative system resulting from a structural simplification process based on the identification of algorithms (i.e. of procedures) and a continuous verification of causal relationships. In addition, the audiovisual language allows one to focus on basic space-time skills that are usually studied and practiced with mini-robots: in this sense, producing a short film means putting into practice both programming skills and the analytic elements that allow one to organize the sequential actions of robot-actors, according to the chosen narrative plot.

In addition to the so-called Digital Rhetoric mentioned above, these ideas should be integrated with those of *multicoding* (Denicolai e Parola, 2017) (in the sense of sharing linguistic codes in the generation of media texts) and of *multimodality* (Kress, 2010), which are elements typical of media communication. The first, understood as a sharing of linguistic codes in the production of the text - or of the media performance - allows one to create narrative products where dialogue between media (understood as expressive technologies, as tools and, in the strictly educational context, as far as mini-robots are concerned, as guiding characters). The second, theorized by Kress, emphasizes how it is possible to construct meaning in a complex and multilayered technological environment such as ours, dominated by Jenkins's transmedial logics (Jenkins, 2007).

### 3. Method and application

The students involved (in this specific case and, in the general experimentation) have to make a short film in which mini-robots are the protagonists of the narrative. As already mentioned, language integration allows them to work on multiple levels of abstraction: not only do they need to concentrate on programming as such, but they also have to think about how mini-robots can express something through their movement and, above all, through the chosen shots and the dubbing of the protagonists' voices. As with pure coding, we have set up a procedure for the realization of these products, enabling students to practice a number of parallel skills that belong to multiple disciplines.

The production of a short film involving robotics unfolds according to this scheme (all the steps are assisted by the research team staff)<sup>2</sup>:

- Conception of the plot: the participants imagine and write a story about a cultural or other topic. In the specific case study presented, students have reasoned on the meaning of the relationship between the cultural and theatrical tradition of puppetry and the technological world. At this stage, participants must work together, according to team building and teamwork dynamics, in identifying a

<sup>2</sup>A similar procedure is also described in Denicolai and Parola (2017), but focused on the production of audiovisual products with stop-motion.

theme and the various characters. They also highlight, upon the invitation of the research staff, the spheres of action and the actants typical of narration and video storytelling, trying to understand and to devise the functional and structural relationships between the different characters.

- Translation of the idea into the script: the participants develop the concept by giving it a more action-based and visual appearance. They also begin to imagine how to shoot robot characters and how get the robots themselves to communicate the actions they are supposed to represent. At the same time, they gain confidence with the robots, acquiring the basic skills to program with the Logo language. In this way they will be able to hypothesize short programming sequences to 'test' movements and actions for the video.

- Storyboard: the subsequent graphic translation of what has been written serves both to synthesize the action (and thus to get the students to practice the important ability to identify the essential elements of an experience) (Denicolai e Parola, 2017) and to provide references for the subsequent programming of the robots and their shooting.

- Realization of the sets: each story is placed in a scenographic context created by the participants, usually with paper. Even in this case, it is important that participants already know the characteristics of the robots' movements, so as to best organize both the shooting and the layout of any objects or scenographic items.

- Programming and shooting: at this stage the participants take the script and program the robots according to the actions they will have to perform. The work is based on the concept of simplification, which is one of the key steps in computational thinking: for each created scene, programming sequences are sketched, while verifying the duration of the movements and their communicative effectiveness. Filming, according to the storyboards, is performed by the participants by working on single scenes, so they have the time to set the various programming sequences and to take multiple shots of the same scene (for a subsequent selection of the best shots). Audio is also recorded.

- Post-production: At this stage, students can work on the syntagmatic organization of their shots. This is a very interesting phase from the educational point of view, since they can experiment with various narrative modes and, above all, have a first way to check the effectiveness of the communication and programming of the mini-robots' movements. In addition, it is possible to further work on space-time skills (especially with younger students) and on the consistency of the actions.

- Return: a fundamental step in which students show their work and analyze the result obtained.

The procedure is the basis for the realization of every short film with mini-robots. In the case of activities with puppets, the students also had to consider the movement of theatrical figures (thus knowing their characteristic aspects and technical requirements), including the latter in the film product also from a narrative standpoint. The dialogue between tradition and technology was therefore the basis to understand how, *mutatis mutandis*, Lupi's puppets and the robots had similar functions and how the former were to some extent the ancestors of the latter. The ideation of the video has therefore required the integration of a third language, namely that of puppetry, in the usual experimental fabric proposed by the experiment.

#### 4. Conclusion

The activity described here is part of a broader experimentation of integration between the audio-visual language and educational robotics, in an attempt to analytically connect videos with computational thought. This activity is currently at an exploratory stage, the purpose of which is to verify all possible modes of teaching innovation and application in different educational contexts (currently, we are testing it in some primary schools, while in the near future we expect to use it also in secondary schools). Specifically, in this case, we have also used puppets in addition to mini-robots, with the aim of bringing the students closer to puppetry while achieving the normally expected educational objectives, including practice of digital competence, communication skills and the ability to apply computational logic. Content creation has allowed the participants to learn to work on different parts of a project (video, robotics, puppets, but also the ideation of the story, its preparation), by training to think by simplifications, in order to achieve a complex educational *artifact* whose parts appear as the result of a series of logical-formal procedures. Finally, the activities have also been subjected to a quantitative and qualitative evaluation, according to a formalized scheme that was also applied in the previous editions of the Summer Junior University (during which an experimental form of storytelling with robots had already been proposed).<sup>3</sup>

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<sup>3</sup>For more on the evaluational aspects, see Denicolai, Grimaldi e Palmieri (2015, 2016)

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## USING IMPULSES AND DILEMMA STORIES FOR STUDENTS' VALUES EDUCATION IN STEM CONTEXT

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### Abstract

Values education is a main objective of education in general and of schools in particular. In a global world, in which multi-culturalism is part of our daily lives, values get more and more important. Specifically dilemmas are used in diverse approaches for values education in school, e.g. the Values and Knowledge Education approach. But such approaches implement dilemmas mainly in language education or social subjects, not in scientific subjects. Thus, we didactically enriched experiments with impulses and dilemma stories in order to sensitize students for values like environmental consciousness or self-activity. We evaluated its realization with two experiments in a third and a fourth grade of an elementary school using qualitative observation and interview data with teachers. Results indicate an effective integration of impulses and dilemma stories in the experimental material in order to foster the sensitization for values. For both classes, a combination of impulses and dilemma stories at the end of the lesson was most effective. Furthermore, students were able to take the protagonists' perspective in the dilemma story and discussed diverse opinions. As the students' activity is of great importance to stimulate reflection on values, this didactical realization was helpful. Overall, this study gives first indications that impulses and dilemma stories are adequate didactical methods to stimulate the sensitization for values in STEM context for students in elementary schools.

**Keywords:** *Impulses, Dilemma Stories, Values Education, STEM Context, Elementary Schools.*

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### 1. Introduction

Values are relevant in all societies over the world: "Values are a fundament of any social community." (Menzel, 2013, p. 12) Values education is one main aim of education – in families as well as in schools as this is an antecedent for a peaceful living together. Values education is an educational mandate of schools which comprises the transfer of values to students in order to treat others e.g. in a peaceful, justified, and tolerant way. Such values are often taught in subjects like religion or ethics. But also in STEM, values education is relevant.

Looking at the definition of science and scientific knowledge, the OECD focuses on two issues: a subject-based and a value-based aspect. In their definition science requires the "understanding of scientific concepts, an ability to apply a scientific perspective [to a problem] and to think scientifically about evidence" (OECD, 2004, p. 26). While the first part of the sentence ("understanding of scientific concepts, an ability to apply a scientific problem to a problem) focuses on the subject-based aspect, the second part ("to think scientifically about evidence") implies the evaluation, decision making, and reflection on questions in STEM context. This competence of evaluation, decision making, and reflection is necessary to be able to actively participate in a controversial discourse on diverse topics and to represent the own opinion taking subject-related scientific information and knowledge as well as individual and social values into account (KMK, 2004, p. 12).

In order to foster values education in STEM context, two methods may be used: impulses and dilemma stories. Impulses are often implemented in a very general way to stimulate a specific behavior like comprehensive thinking and talking of the students (Spanhel, 1971) which includes the expression of an opinion and the justification of this opinion in an argumentative manner. Impulses could be used in various scenarios and content areas; in the beginning of a discussion, but also at the end of a lesson after finishing the mediation of the content.

Dilemma stories are narratives about a situation in which a protagonist has to choose between two unpleasant and morally inconsistent alternatives which both are connected to a displeasing consequence (Lind, 2011). Anyhow, individuals have to decide on one of these alternatives. In this

decision process, a moral judgement is necessary in which diverse competitive values are balanced and some prioritized. As this decision is very tricky, individuals get cognitively and emotionally involved. Dilemma stories could be integrated in a flexible manner in diverse content as well as in experiments in order to reflect on its represented values and its relevance for the individual, society, and the whole world.

In STEM context, both methods impulses and dilemma stories could be integrated in a flexible manner. Furthermore, they stimulate the reflection on its represented values (like environmental consciousness) and its relevance for the individual, society, and the whole world. “Reflection enables us to correct distortions in our beliefs and errors in problem-solving.” (Mezirow, 1990, p. 1). Summarizing the mechanisms of impulses and dilemma stories, they both foster reflective activities in order to sensitize students for values in STEM education.

## 2. Learning Environment

In order to introduce impulses and dilemma stories in STEM, we used experimental material from the international program “Experimento” of the Siemens Foundation. In “Experimento”, a problem-based learning environment offers learner-centered designed experiments in small groups with help of realization guidelines in a self-directed manner. This material was enriched with impulses and dilemma stories.

“Experimento” was developed for diverse schools for students of different age. We focused on “Experimento 8+” which was developed for primary schools and students from eight to ten years old. The experimental material is connected to the curriculum of the diverse schools.

### 2.1. Content Areas and Values in “Experimento 8+”

The project “Experimento 8+” comprises three content areas: (1) energy in which learners are confronted with topics like electric circuit or energy production; (2) environment with themes like water circulation, air pollution, or renewable energies; (3) health including aspects of the body as nutrient food, hygiene or senses of hearing or seeing.

In all three content areas, overall there were 42 modules with experiments in “Experimento 8+”. In our project on values integration, twelve experiments were enriched with impulses and dilemma stories to integrate value issues. These experiments were chosen according to their fit to specific values being part of a values catalog adapted to scientific issues and the execution of experiments. The values catalog comprises diverse values like e.g. environmental consciousness, sustainability or self-activity which are relevant for the content area environment.

### 2.2. Impulses and Dilemma Stories in STEM Education

Impulses and dilemma stories were conceptualized around the values catalog and chosen according to their fit to the content of the respective experiments. They both were integrated at the end of the experiment. Teachers could use impulses or dilemma stories in a single way or they could use both didactical methods together. Integrating them after conducting the experiment is due to the fact that it is easier for students to discuss on value-related issues when they have some prior knowledge on the respective topic which is to be reflected on. Table 1 presents one example of the realization of impulses (with impulse sentence, impulse question, and impulse picture) and dilemma stories.

Figure 1. Impulse and Dilemma Story of the Module “Recycling of Organic Waste” for Primary Schools.

| Content Area | Module   | Impulse  | Dilemma Story  |
|--------------|--|--|--|
| Environment  | Recycling of Organic Waste<br><br>Value:<br>Environmental Consciousness<br>Self-activity | <i>Impulse:</i> You know a lot about organic waste. When you look in your bio-waste container you detect paper and plastic.<br><i>Impulse Question:</i> Why do different things not belong in the bio-waste container?<br><i>Impulse Picture:</i><br> | <i>Paul-Waste-Dilemma-Story:</i><br>Today is the birthday of your classmate Paul. His mother gave him gummy bears in small bags for his classmates. He collects each of the single bags in one bigger bag. You watch that Paul throws the whole bag into the bio-waste container.<br><b>Think about:</b> What would you do in place of Paul? |

### 3. Research Questions

We specifically focused on two main research questions:

1. How are impulses and dilemma stories realized in the conducted designed experiments for fostering values education?
2. How do students handle impulses and dilemma stories in the designed experiments for fostering values education?

### 4. Method

#### 4.1. Design and Sample of the Study

The study was a field study evaluating the realization of impulses and dilemma stories in two (out of 12) experiments. These were from the content area energy with the module “Solar Cells” and from the content area environment with the module “Recycling of organic waste”. Both modules were about values like environmental consciousness or self-activity.

The sample of the study consisted of 19 students in a third grade and 23 students of a fourth grade of an elementary school in Germany. Both female teachers who conducted the lessons were very experienced with more than 20 years in their occupation. Each of the two experiments was realized in the third and in the fourth class.

#### 4.2. Data Sources and Data Analyses

Data were gathered with observation data and interviews. Two independent observers participated in the experiments without being active. They used pre-structured observation sheets for noting all relevant issues (Lötscher, 2014).

We analyzed the observation sheets according to two categories, namely realization of impulses and dilemma stories in the experiment and the students’ handling with impulses and dilemma stories. For the realization of impulses and dilemma stories (research question 1), (1) the instruction of impulses and dilemma stories, (2) the processing of impulses and dilemma stories and (3) the documentation of results was of interest. For the students’ handling of impulses and dilemma stories (research question 2) five categories were used: (1) expressing statements, (2) justifying opinions, (3) taking the perspective of the protagonist, (4) articulating problems with handling the dilemma, and (5) interaction with the teacher.

Interviews were conducted after the lesson with the respective teacher using a pre-structured half-standardized interview guideline. The transcriptions of the interviews were analyzed according to propositions concerning the main categories for answering the research questions.

Unit of analyses was one proposition. Main analyzing categories were the same as for the observation sheets. Furthermore, regarding realization the same three categories of analyses were used (instruction of impulses and dilemma stories, processing of impulses and dilemma stories and documentation of results). For the students’ handling, again the same five categories mentioned above were used.

### 5. Results

#### 5.1. Research Question 1

In respect of the realization of impulses and dilemma stories in the experiments “Solar Cells” and “Recycling of organic waste”, the categories of analyses were instruction, processing, and documentation.

The *instruction* was realized in a combination of showing the impulse picture on the whiteboard and narrating the dilemma story from the teacher. While students watched the impulse picture, the teachers told them the dilemma story verbally. After introducing the dilemma, students had to discuss their opinions (*processing*). The discussion of the arguments took part in two ways: In the experiment on “Solar Cells”, all students discussed their diverse points of view in the plenum of the whole class. In the experiment on “Organic Waste”, this was realized in small groups. Groups of five students had to think about adequate arguments and fill-in a pre-structured work sheet with two columns on opinions and on comments. After writing down their arguments, they had to pass them over to the next group. According to the diverse didactical methods of processing, the *documentation* of the two experiments was also twofold: In “Solar Cells” the teacher repeated the main issues verbally in the plenum of the class. In the module on “Organic Waste”, each group presented their diverse arguments which were documented on the sheets of paper. Afterwards, the teacher picked them up and summarized them verbally.

The interview data with the teachers confirmed observation data. Specifically, teachers compared classroom and small group discussion. Both are convinced that in small group work, students had to be more engaged and debate more in-depth when using a working sheet, even though, there are also some members who just look stupid while the others do their work (Interview 2, Lines 212-214).

## 5.2. Research Question 2

Five issues were of interest for answering this question: expressing statements, justifying opinions, taking the perspective of the protagonist of the story, articulating problems with handling the dilemma story, and interacting with the teacher.

In the first experiment on “Solar Cells” with classroom discussion, about 80 per cent of the students were actively *expressing* their statements. They also *justified* them with adequate arguments like “Solar cells are causing less impact on the environment, because they have less harmful substances” (Observation Sheet 3, page 4) indicating sustainability and environmental consciousness. They were also able to *take the perspective* of the protagonist of the story highlighting pros and cons of both positions (see above and: “Solar cells are very expensive and do not work without sun.”; Observation Sheet 3, page 4). As the discussion on the dilemma story was very interactive without requesting further help from the teacher, there were no *problems* in understanding the main issues. The teachers *interacted* as moderators who repeated and summarized the students’ ideas, and stimulated the students’ debate without intervening with own ideas or opinions.

In the second experiment on “Recycling of Organic Waste”, learners had to cooperatively write joint ideas on solving the dilemma as well as comments on ideas of different groups. All in all, seven diverse *statements* were *expressed* and nine comments added in the fourth grade and five statements and five comments in the third grade. All students disagreed on the behavior of the protagonist of the story and *justified* their opinions why this behavior is not correct. The arguments gave indications on values like environmental consciousness (e.g. reducing waste by changing the present) and self-activity (e.g. telling Paul that his behavior is not correct). As every idea on the worksheets was accompanied by different suggestions on the other side, students were not only able to take the protagonists’ *perspective*, but also their classmates’ perspective. No *problems* were articulated. The *interaction* with the teachers was little, because they acted as moderators, going from one group to another, offering help or further support which was seldom needed. Sometimes they prompted students to an issue for thinking on. At the end of the lesson, after groups’ presented their results, the teacher summarized most important issues in the plenum.

Interview data confirmed the presented observation data. Overall, both teachers had the impression that by taking the perspective of the protagonist of the dilemma stories, students were able to reflect on value issues and get sensitized for values.

## 6. Summary and Discussion

The results of the study gives first indications that it was possible to sensitize students for values like environmental consciousness of self-activity using impulses and dilemma stories at the end of scientific experiments. This may be due to the fact that first, students gained adequate knowledge which was necessary for stimulating an elaborated discussion after the experiment. Second, the combination of both methods of impulse and dilemma story stimulated two diverse senses (hearing and watching) and thus, simplified a deep reflection on these issues (Mayer, 2001). Thus, students were very engaged in processing the dilemma story in class discussion, but also in small group work. The documentation of the arguments confirmed the sensitization for values like environmental consciousness or sustainability (see above). Furthermore, according to observation and interview data, it seemed that group discussion triggered students’ cognitive activity more than whole class discussion (Slavin, 2010) – even though this could not be proven objectively. Furthermore, group discussion needs more time than discussion in the whole class.

Looking at the handling of the dilemma stories in more detail, results indicate that students were able to express statements. Thus, students understood the dilemma story and took the protagonist’s perspective which is a main antecedent for comparing and evaluating the problem of the story in order to solve it (Weinberger, Kriegseisen, Loch, & Wingelmüller, 2005). Furthermore, students elaborated their points of view and justified their opinions (see above “Solar cells are causing less impact on the environment, because they have less harmful substances”) indicating that students reflected on the story (Schuster, 2001). This statement suggests that the value sustainability was triggered. The teachers interacted as moderators who prompted students to specific issues or offered help. But this help was seldom needed. Most times, teachers did not actively intervene in the discussion. This is in line with a socio-constructivist perspective on learning, which stresses learning as a “social-interactive, contextual,

constructive, self-regulated and reflective process” (Simons, 1990, p. 1). Specifically diverse perspectives and perspective-taking are stressed in this theory which was stimulated by the teachers.

## 7. Implications

Regarding the implementation of impulses and dilemma stories for STEM education, we did first steps in the direction of sensitizing students for values. Based on first indications, there are three main implications of this study for practice: *First* of all, it seems that a combination of both methods in such a way that two senses are triggered (with a visual picture and a narrative story) is effective for an active dilemma discussion (Mayer, 2001). *Second*, small group discussion is more adequate to stimulate cognitive conflicts and thus reflection on diverse opinions than classroom discussion (Slavin, 2010). And *third*, learners’ cognitive activity is an antecedent for being able to take diverse perspectives and for reflection of values, which is in line with socio-constructivist approaches (Simons, 1990).

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## CRITICAL SUCCESS FACTORS OF DISTANCE–LEARNING: QUALITY CONSIDERATIONS

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### Abstract

The objective of this paper is to map the published literature with respect to the factors that are likely to influence distance learning implementation. A systematic literature review (SLR) was conducted to identify relevant publications using as a source for the review the following three databases: Emerald, Elsevier (Science Direct), and Wiley. The literature was assessed based on analysis of characteristics relating to publications and authors. Of the 230 publications identified, 81 were included for systematic review. One of the main findings of this research is that the distance learning appears to be in the state of an emerging field, in the sense that it is intended to emphasize specific issues only, not the “big picture”. Also a number of meaningful factors were extracted from the publication list of those three databases, which will be the basis of future empirical research in order to develop a more complete picture of the relative impact of each to influencing DL implementation. By only using the three electronic databases the study may not have allowed a complete coverage of all empirical articles in the field of CSFs in DL implementation. Also the fact that the literature review was restricted to specific search terms this could also be a limitation of this study. Nevertheless, it is believed that the findings provide a valuable understanding of the current situation in this research field.

**Keywords:** *Assessment, Literature review, critical-success-factors, distance- learning, quality.*

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### 1. Introduction

As information and communication technology penetrates almost all disciplines and fields, education field is no exception (Moller, Foshay, & Huett, 2008). It is one of the most important domains where technology is significantly used since its inception in 1990. Distance Learning (DL), sometimes called e-learning, is considered a strong support to the educational systems. It is a formalized teaching and learning system built upon electronic and telecommunication technology to remotely transfer information to users (Stonebraker & Hazeltine, 2004). McCue (2014) indicated that DL is a booming industry which from revenues of \$35.6 billion in 2011 would increase to \$107 billion in 2015 with higher education being a major market for DL products and services. According to Allen and Seaman (2015) over 95% of institutions with more than 5,000 students in total reported DL offerings with the relative speed at which participants adopt to DL being in the range of 35 percent (Sun, Tasi, Finger, Chen, & Yeh, 2008; Al-Marabeh & Mohammad, 2013).

However, although DL has been well introduced in a number of educational institutes, failure rates between 20 to 40% do exist (Rostaminezhad, Mozayani, Norozi, & Iziy, 2013; Kim & Park, 2011; Sun et al., 2008), and they are much higher in traditional classroom based teaching (O'Connor, Sceiford, Wang, Foucar-Szocki, & Griffin, 2003). Identifying and examining the Critical Success Factors (CSFs) contributing to the successful implementation of DL projects is one way for improving success rates and reduce projects' failure rates. CSFs are those competitive factors that drive an organization's success (Sila & Ebrahimpour 2005; Soltani, Lai, & Gharneh, 2005). According to Freund (1988) CSFs are “*those things that must be done if a company is to be successful*”. Recognizing CSFs is essential as it helps organization to focus on the necessary capabilities needed to meet the CSFs; alternatively, they can help the organization decide if it has the necessary resources and capabilities to build upon them in order to meet CSFs.

Although in recent years a number of researchers have conducted DL implementation studies, within the context of higher education (Sun et al., 2008; Hammoud, 2010; Musa & Othman, 2012; Taha, 2013), there is very little empirical research in identifying all the factors that contribute to the success of DL (Wagner, Hassanein, & Head, 2009). Papp (2000) explored DL from a macro perspective and suggested a number of CSFs such as appropriateness of the course to the DL environment needs, content

and maintenance of the DL course, DL environment, etc. that can aid faculty and institutions in DL development. Benigno and Trentin (2000) proposed a framework for assessing DL courses, focusing in evaluating the students' learning and performance aspects. Volery and Lord (2000) using a survey study in students attending a DL course, identified the following three CSFs: instructor, technology, and previous use of technology.

Although students and teachers are important stakeholders in DL (Kituyi & Tsubira, 2013), there is a need to *consider all factors* that could influence the success of a DL project. Understanding which stakeholders promote or obstruct DL can help to establish a more favourable learning environment that will inspire students for DL and reduce the failure rates of DL projects (Shroff, Deneen, & Ng, 2011; Alsabawy, Cater-Steel, & Soar, 2013). Therefore, the primary aim of this paper is to synthesize the published literature concerning CSFs for DL. This research will not only contribute to the current knowledge in the DL field, but it will also serve as an instrument to explore future trends of DL. The significance of this research effort is generated due to the lack of substantial research in addressing DL frameworks and CSFs in order to leverage the success rate and effectiveness of DL projects. To achieve this aim, a Systematic Literature Review (SLR) approach was used as research methodology. SLRs bring a rigorous methodology and provide transparency and reproducibility to the process of reviewing research. However, two constraints of a SLR are that not all papers might be identified (Lefebvre, Manheimer, & Glanville, 2011) and the SLR search may lag behind trends (Chermak & Musiek, 2006). To ease these constraints, the authors have chosen well-known academic publishers to ensure a possible full coverage of the entire research area and that all papers were captured, time-wise. This allowed us to pose the following two research questions:

1. Publications review: What changes occur in publication patterns over time? What types of outlets are used by researchers to disseminate their research findings?

2. Authors review: How many authors are credited in these research articles? In which country are the first authors based? Are all, and to what extent, authors contributing and collaborating in DL area?

The remainder of this paper is organized into three sections. In section two the research methodology used is described. In section three the results obtained by applying the proposed methodology are cited and discussed, and section four concludes.

## 2. Research Methodology

Fink (2005) succinctly defines a SLR as a 'systematic, explicit, and reproducible method for identifying, evaluating, and synthesising the existing body of completed and recorded work produced by researchers, scholars, and practitioners' (Tranfield, Denyer, & Smart, 2003). The adopted SLR process is inspired by the works of Tranfield et al. (2003), and follows six distinct stages: problem definition, search strategy, application of exclusion criteria, collection of data, analysis of data and reporting. The initial three stages are described in this section, whereas the last three stages are described in the third section: results, where the review-findings with respect to publications, authors and content are discussed in length.

### *Problem definition*

As a limited number of papers have been published during the past decades with respect to the CSFs that influence DL implementation, this *appeared as an opportunity* to further this area and to improve the published knowledge about the CSFs for DL. For this reason, an analysis methodology is used, which contains the characteristics of: publications, authors and content. In that way a good first approach of documenting the existing literature can be done, which, in turn, can guide further development efforts and priorities.

### *Search strategy*

A SLR is a structured approach to reviewing published academic research, as opposed to the more common narrative-based review (Tranfield et al., 2003). The search strategy protocol consisted of ten DL search terms (distance, e-learning), four CSF search terms (success, factor, critical, key factor and CSF), three major management research databases (Emerald, Elsevier, and Wiley), utilization of Boolean operators (OR/AND), full text search and three main exclusion criteria. According to Ghadge et al. (2012) the quality of SLR is driven by the data sources that are used for analysis. This is the reason that these three publishers were chosen, since they provide the best coverage for our purpose, they are vastly available in the academic world and they are widely accepted and used by earlier reviews (Hohenstein, Feisel, & Hartmann, 2014).

The search of each database used the DL search terms above if present in the title, abstract or keywords, and was combined with the four CSFs search terms, only if they were mentioned in the title, abstract or keywords. No time restrictions were applied. The searches were limited to publications in the English language, and were last performed in January 2017. This search strategy was modified to suit each database. Further individual searches for each database were carried out to improve the quality of the overall search.

After removal of the duplicates, only 225 original articles remained to be screened for exclusion criteria. A manual search added another five publications resulted in a list of 230 publications. These additional publications were located through the reference sections of the original articles.

#### *Apply exclusion criteria*

Once the original search of all three databases was completed, the two authors independently assessed the records one by one, based on their abstracts in order to identify unrelated papers. The assessment excluded 144 records, thus leaving 81 articles for further search. The second and final stage consisted of a full-text screening of the publications by both authors. Upon assessment, each reviewer independently decided which articles were eligible to be included in the systematic review. Any disagreement was resolved by a discussion between the two authors. A total of 81 articles were included in the systematic review. Information concerning the details of each study was consolidated in a first coding sheet, and included the following characteristics:

1. Country and setting of the study/tool
2. Year of publication
3. Author(s)
4. Journal of publication

### **3. Results**

One of the most important questions that this research tries to assess is the extent to which DL is developing. Due to the space constraints of the current publication, the present paper will only synthesize the relevant literature in two characteristics: publications and authors.

#### *Publication characteristics*

A descriptive analysis of publication trends in a number of leading science education journals provides context to evaluate trends and determine future directions in the frequency of research over time and to examine to what extent frequency is changing. One of the most common analyses used to evaluate publication trends, is the publication rate which reflects the yearly frequency of publications. The first publication focusing on CSFs for DL appeared in 1991 followed by a second one in 1999. Since then, there are papers published almost non-stop every year. The particular research area therefore extends for approximately 18 years and it is safe to conclude that it is a relatively young area. From 1991 to 2006 the number of yearly publications fluctuates around a low average, slightly between zero and five, which is a clear indication that there is no increasing trend in publications. For the period 2007-2017, the rate increases but not to a large extent, as it fluctuates between two and nine. Overall, the survey of the literature indicates an increase in interest during the period of study.

The analysis of the source type records the type of outlet that publishes work in this research area. In the specific case, a total of 38 different publication outlets was identified from the set of 81 publications with a percentage of 72 percent being in academic journals and 18 percent in conference proceeding (published through *Procedia - Social and Behavioral Sciences*). The most frequently used academic journals were *Campus-Wide Information Systems* (12), *Computers & Education* (9), *Decision Sciences Journal of Innovative Education* (5), *British Journal of Educational Technology* (4), *International Journal of Educational Management* (4) and *Journal of Computer Assisted Learning* (4). From the review of the publications it occurs that there is tendency to translate findings into practical implications for educational practitioners.

The strong concentration of publications in academic journals as a primary source type may illustrate a level of investigation maturity of scholars (Nissen, 1996). Furthermore, the distribution of publications shows two-three dominant publication outlets in this research area which demonstrates a certain level of maturity in the research area. Considering however that besides the dominant publication outlets, several outlets also host the specific subject may be indicative of a growing trend.

#### *Author characteristics*

In this analysis three author's criteria are examined: quantity, diversity and collaboration. The first criterion, that of the author quantity, records in the specific set of publications, the most frequent authors and emergence of new authors publishing in DL. The three databases contain 81 publications with 187 unique authors, where only five authors published more than one paper in this research area, namely: K. Becker, J.E. Klobas, M.A. McPherson, J.M. Nunes and E.S.I. Ossiannilsson, all with two each. The rest of the authors published only one publication in the set examined. The prevailing observation in this case is that a defined set of authors is not yet established. There is no observed pattern on the years of publication of these five authors. Some publications go back to 2007 and others are more recent in 2014 and 2017. Conclusively it can be said that it does not seem as if a main core of contributors to this research area exists or is emerging.

By examining the frequency of new authors publishing in DL, no clear conclusions can be drawn. The number of new authors does not increase every year throughout the time period examined although the research area attracts new authors. According to Maloni, Carter and Carr, (2009), the

appearance of new authors to a core set of established authors is an indication of the development of a research area. Next the origin of the authors' country is investigated (diversity of authors) to verify the extent of author interest in one country or if it is dispersed around the world. A total of 30 different countries are represented by the 187 authors. Most authors come from the USA (19%, 35 authors), the UK (17%, 31 authors), Malaysia (9%, 16 authors), Australia (6,5% 12 authors) and Turkey (6%, 11 authors). Other countries that are represented in the publication set are Taiwan with 10 authors, Iran, India and the Republic of Korea all with 8 authors. Interestingly, the research area is attracting interest from authors around the world representing all continents. However, the primary concentration is in five countries accounting for 105 authors. Although it seems promising that the five countries are dispersed in four continents, it cannot be neglected that the specific research area could only benefit from broader participation of authors around the world. Lastly, the high concentration of authors in the USA and UK may be an indication that CSF in DL is coming up as a research area (Maloni, Carter, & Kaufmann, 2012).

The final criterion that will be examined is that of the collaboration between authors from different countries and number of authors. Out of the 81 publications, 51 were produced by two or more authors and only nine publications is a product of multi-country collaborations (11%). The collaborations took place between Malaysia-Germany-Iran, USA-Turkey, USA-Nigeria, Singapore-Hong Kong-USA, France-Australia, United Arab Emirates-Australia-Saudi Arabia, Australia-Italy, China-USA and UK-Saudi Arabia (each with one collaboration). This level of multi-country collaboration indicates that CSFs in DL is still an emerging research area (Borrego and Bernhard, 2011). The remaining 72 publications were produced merely by authors of the same country.

#### 4. Conclusions

The paper conducted a systematic literature review of three databases (Emerald, Elsevier and Wiley) to identify the published literature with respect to the factors that are likely to influence distance learning implementation. The publication set established screened 230 publications concluding to 81. The assessment was based on the analysis of the publication and author characteristics. The main finding of the research is that distance learning seems to be an emerging field; it extends for approximately 18 years. Yearly publications fluctuate with low averages and there is no clear indication for increasing trends although there is increase in interest. The source type that publishes work in the research area is largely academic journals with a tendency to reflect findings into practical implications. There is quite an important distribution of publications with only a few dominant publication outlets which indicates a growing trend of the research area. There is no defined set of authors after the examination of author characteristic and there is no standard increase per year on the new authors that publish in the field. There is a good spread of authors around the world; however the large concentration is on five countries in four continents. Collaboration between countries is low. All the above observations, considering the limitations of the research presented in section 2, indicate that although there is interest in the research area, CSFs in DL is still an emerging research field. Naturally, further review of the literature will verify the initial conclusions of the research.

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## THE FUNDAMENTAL VALUES FOR INTERCULTURAL MEDIATION IN MELILLIAN SCHOOLS

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### Abstract

Melilla is a Spanish city situated in the north of Africa. This city reflects the cultural diversity currently enjoyed by most European cities it receives a large number of immigrants. So much so, that in the last decades Melilla has been enriched by the different cultures and people from the south of Africa, Pakistan or Syria. This fact has complemented the current cultural diversity which already exists. This cultural mix manifests the need to educate young people in common values in the classroom to guarantee the peaceful coexistence and the cultural tolerance of students. For this reason we focus on the diagnosis of intercultural values in the Melilla school classrooms (N = 150). These values are evaluated through the intercultural values questionnaire (Tomé, 2012) and analysed through the latest version of the statistical software (SPSS). This questionnaire collects data about three types of intercultural values: primary, secondary and tertiary. The purpose is to detect the goals in which the role of teachers in Melilla (as cultural mediators) should be focused. This research is financed by the Institute of the Cultures of Melilla through the competitive program of scholarships about this topic.

**Keywords:** *Intercultural Values, Intercultural mediation, Intercultural Education, Melilla, Institute of the Cultures.*

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### 1. Introduction

Actually, the Melilla society is formed by individuals from different religions, ethnicities or cultures. (Tomé, Expósito & Berrocal, 2013). As a result of this, in the schools of the city, not only the intercultural characteristics of the city are reflected, but also the problems of coexistence. Due to cultural diversity and the lack of information about the characteristics of students from different countries.

There are several researchers as, (Coulby, 2006; Jester, 2008; Jordán, Ortega, & Mínguez, 2002; Portera, 2004), who believe that values education are essential for peaceful coexistence. More specifically Touriñan (2008) highlights the need to teach values to promote intercultural awareness of society. These values, promote relations and exchange of experiences between cultures and increase communication between members of a classroom and / or a school (Buendía, 2007; Ruiz, 2002; Sabariego, 2002).

Tomé (2012) in a study conducted in Melilla classifies and validates a system of categories of intercultural values. Also, she defined as values that emerge from the Spanish Constitution, the Universal Declaration of Human Rights and the Constitution of the European Union. For the author to educate in these values, helping the future formation of citizens able to respond to any problems arising in intercultural coexistence (Santos, 2010), as they are put into use related values with dignity, justice, freedom, equality, solidarity, diversity, transparency and citizenship (Touriñan, 2003).

More specifically, the author classifies the securities as their importance to intercultural coexistence, in primary, secondary and tertiary intercultural values and conceptualized as follows (Tomé & Manzano, 2016):

1. Primary intercultural values: They are transmitted directly in intercultural inclusive education. These values are:

- Moral and ethical values: Represent attitudes and actions related to good and duty.
- Social values: Related to behavior toward the social group.

- Transcendental values whose attitudes and actions are linked to religion and the Supreme Being.

2. Secondary intercultural values: These are values whose acquisition helps the assimilation of primary intercultural values, although their transmission does not occur directly in intercultural inclusive education. These values are:

- Intercultural / unethical values: These values are those related to cultural knowledge, instructional interest and the cultural environment.

- Productive values: They are linked to social and material goods.

- Values of change whose attitudes and actions relate to adaptation, improvement and innovation.

3. Tertiary intercultural values: They consider those that together with secondary intercultural values facilitate the acquisition of primary intercultural values. These values are:

- Vital values: Related to the attitudes and actions of basic needs, needs for fun and health and hygiene.

- Aesthetic values: Beauty and artistic activity.

- Values of personal development: Attitudes and actions are related to self-realization, self affirmation and the development of personal qualities.

- Ecological values: Attitudes and actions linked to ecology and nature.

The role of the teacher as an intercultural mediator is highlighted in this communication, which will make use of these values for, among other things (Cohen-Emerique, 2011):

1. To facilitate communication between students of different cultures.

2. To help the reconciliation of people belonging to different cultural identities.

3. To establish new patterns and ways of relating to cultural conflicts.

In this paper, we intend to know the intercultural values presented by the students of Melilla to serve as a guide in the intercultural mediation of teachers who deal with them. We think that this information will help focus the work of the mediator in those deficient values to serve due to conflict resolution or to the understanding of the parties involved. (Llevot, 2011).

## 2. Design

This research aims to test the hypothesis that is: Melillenses students do not have intercultural values. For this, the questionnaire intercultural values have been passed (Tomé, 2012) to a sample of 177 students from several primary levels in the City of Melilla. Subsequently the results with SPSS were analyzed in its latest version.

## 3. Objectives

In this paper, we intend to know the intercultural values presented by the Melilla students of Primary level.

## 4. Methods

This is an investigation ex-post-facto, in which intercultural values present was diagnosed in students of Primary Education of Melilla. For this, a non-probabilistic sampling was performed in which different students from different schools in the city will be selected.

The diagnosis of intercultural values of those students was conducted by questionnaire intercultural values (Tomé, 2012). The instrument consists of a Lickert scale numbered from 1 to 5, where the student evaluates the degree of knowledge and use of each value where (1 = Never; 5 = Always). In addition it is seen as independent variables, age, gender, religion and the current course of schooling. Moreover, as dependent variables all questionnaire items that are grouped into three categories (primary intercultural values, secondary and tertiary intercultural values intercultural values).

The analysis of all data was performed using SPSS statistical software in its latest version.

### 4.1. Sample

The distribution of the sample shown in Table 1.

Table 1. Sample distribution by schools.

| Schools                                    | Number of students |
|--|--------------------|
| 1. Colegio Enrique Soler                   | 10                 |
| 2. Colegio Público Reyes Católicos         | 15                 |
| 3. CP Anselmo Pardo Alcaide                | 12                 |
| 4. Colegio Público Mediterráneo            | 25                 |
| 5. Colegio Público Juan Caro               | 17                 |
| 6. Colegio Público Pintor Eduardo Morillas | 13                 |
| 7. Colegio Público Velázquez               | 18                 |
| 8. Colegio Público Hipódromo               | 11                 |
| 9. Colegio La salle                        | 14                 |
| 10. Colegio Público Real                   | 13                 |
| 11. C.E.I.P. España                        | 12                 |
| 12. Colegio Público Constitución           | 17                 |

## 4.2. Results

The results obtained in this research were as follows.

Table 2. Percentage of present values in students of Melilla.

|                  | Values               | %     |
|------------------|----------------------|-------|
| Primary values   | Morals and ethics    | 19,18 |
|                  | Social               |       |
|                  | Transcendental       |       |
| Secondary Values | Intellectuals        | 56,61 |
|                  | Productive           |       |
|                  | Exchange             |       |
| Tertiary Values  | Vital                | 24,21 |
|                  | Affective            |       |
|                  | Aesthetics           |       |
|                  | Personal development |       |
|                  | Ecological           |       |

**Primary values.** The primary values dimension appears with a percentage of 19.18%. The three categories that form this dimension is reflected as follows: Moral values appear with a percentage of 11.54% (Option for good 7.64% and Option for duty 3.91%), social values appear with a percentage of 7.45% (social group 5.03%, social position 0% and social improvement 2.42%) and the transcendental values are included in the manual with a percentage of the 0.19% (Religious 0.19% and Supreme Being 0%).

**Secondary values.** The dimension of secondary values is reflected in the students in a percentage of 56.61%. The categories that make up this dimension appear with the following percentages: Intellectuals / no ethical values with a percentage of 32.77% (Cultural knowledge 13.97%, instructional interest 17.88% and cultural environment 0.93%), production values with a percentage of appearance of 20.30% (Material goods 7.26% and social goods 13.03%) and values of changes with a percentage of 3.54%.

**Tertiary values.** The percentage of appearance of these dimension values is 24.21%. The categories that make up this dimension are included in the students as follows: vital values are reflected with a percentage of 1.12% (basic needs 0.74%, leisure needs 0% and health and hygiene 0.37%), The affective values appear with a percentage of 4.65% (family relationship, 1.49%, friendship 2.79% and couple relationship 0.37%). The aesthetic values do not appear in the textbook, personal development values are reflected in the manual with a percentage of 14.90% (self Realisation 0.56%, Self-assertion 0.37% and personal quality 13.97%) and Ecological values are included in 3.54%.

## 5. Discussion & Conclusions

We can consider Melilla as a city where citizenship is exemplified intercultural (Cortina, 2002; Martinez, 2001; Zapata-Barrero, 2001). Cortina (2002) defines citizenship such as that provided by the dialogue between cultures, respect for differences and results in the joint election of values and customs that are worth keeping in a just coexistence and happiness. Therefore, we think in view of the results, the students in our sample have chosen jointly evaluated intercultural values, since a high proportion of these adolescents keep them in situations of intercultural coexistence, especially secondary intercultural values.

This fact could be a direct cause of the transmission of values produced in the Spanish educational system. Schools in the city of Melilla, guide their curriculums in transmitting reflected in the Spanish Constitution values and the current education law. This law is presented as one of the fundamental principles, transmission and implementation of values that freedom, responsibility, democratic citizenship, solidarity, tolerance, equality, respect and justice, As well as to help overcome any kind of discrimination (LOMCE, 2013). All these aspects are directly related to intercultural values found in the sample evaluated. Therefore, the main conclusions of this paper are:

- All dimensions of intercultural values are represented in the students tested.
- Secondary intercultural values are the most representative category.
- Primary intercultural values are the least representative category.
- The related subcategory of unethical values is the values that are presented in greater proportions in students evaluated. Especially those related to instructional interest.
- The related subcategory of transcendental values is presented in smaller proportions in the sample.

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# **TEACHING PLACEMENTS ABROAD: A PILOT PROGRAM ON THE ACQUISITION OF INTERCULTURAL COMPETENCES**

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## **Abstract**

This study describes a pilot programme within a European project on transferable skills acquired on work placements abroad. During three different placement periods from 2012-15, groups of up to twelve Primary Education students from the University of Alicante participated each year during three months on a pilot programme to measure the acquisition of intercultural competences. The study was divided into various phases: initial testing, pre-departure training, reflection diaries and post testing. Firstly, the students were asked to take the Intercultural Development Inventory (IDI) test prior to their departure. Based on the results, pre-departure intercultural training was designed and delivered at the home institution. In the next step, during the twelve weeks of the teaching training placement at different Primary schools in England, Italy and France, the students wrote an on-line reflective diary that had a dozen guided questions. Each week they had to reflect and write about a different question. Lastly, upon their return, these students took the IDI test a second time to measure competency gain. The results of this pilot programme show the benefits of pre-departure training and reflective diaries to aid students in the acquisition of intercultural competences on work placements at schools abroad.

**Keywords:** *Teaching placements, abroad, intercultural competence, diaries, reflection.*

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## **1. Introduction**

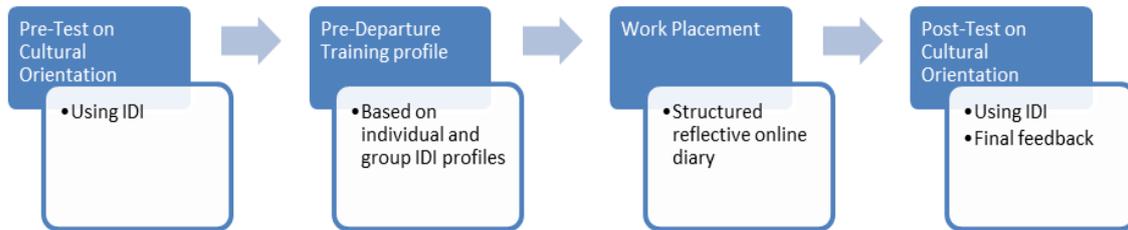
Teaching placements abroad are possible in some in teaching programmes. This is the case at the University of Alicante which offers a limited number of pre-service Primary Education teachers a three month placement as part of their degree programme. These placements are done at selected schools in Europe that follow the Spanish Education curriculum. According to Cushner and Brennan (2007) these experiences abroad allow student teachers to become more self-efficient, provide them with more opportunities to observe different ways of teaching and lastly, allow them to expand their cultural development. The last of these conclusions is supported in research by Malfatti (2012) and Dozier and Stephans (2012) who have found that teaching abroad experiences can increase cultural adaptability of future teachers by providing them with new perspectives which can make them more responsive. In 2012, at the Faculty of Education it became possible for pre-service teachers to participate on a European project on transferable skills acquired on work placements abroad (SKILL2E - <http://skill2e.fh-salzburg.ac.at/>). This context provided the researchers at the University of Alicante with the possibility to analyze the development of the intercultural competence of preservice teachers on placements abroad through an assessable framework. Although the project ended in late 2012, this framework continued to be used until 2015 as the number of students (maximum 12 each year) that could participate was very limited. The results of the pilot programme show that students do benefit from teach abroad experiences within a supported framework.

## **2. Methodology and Objectives**

The design of the pilot programme followed the approach outlined in the SKILL2E model (Tabuenca, Abermann & Eder, 2012; Abermann & Tabuenca, 2016). There were universities from seven different European countries that participated on the project and the students were from different degree programmes. Thus, in this project, the idea was to create a framework that could be adapted to any degree programme and all work abroad placements to help students develop their intercultural competence. The model developed had four main phases which included: a pre-test on cultural orientation,

pre-departure training, reflective online diary and final feedback. The following figure (Figure 1) illustrates the different phases of the model.

Figure 1. Phases of the model.



The first phase was an initial assessment where the Intercultural Development Inventory (IDI) was used. This tool is highly effective in assessing someone’s initial cultural status (Paige, 2004) to be able to design a training programme that moves the participant along the developmental scale for intercultural competences. This test has been used in previous studies (Engle and Engle, 2004) with pre-service teachers. The test is a 50-item questionnaire done online that illustrates the respondent’s cultural profile and the corresponding position along the Intercultural Developmental Continuum (IDC) (Hammer, 1999, 2009). There are two scores, the actual cultural orientation and the Perceived Orientation (a score that indicates how the respondent sees himself/herself along the developmental continuum which is indicative of his/her most likely cultural (non)openness in an intercultural interaction).

The second phase was the design of/and pre-departure training. The model contemplated a four hour, one day training session based on based on previous research on intercultural training (Gudykunst, Ting-Toomey and Wiseman, 1991). The training had learning outcomes (Butcher and Marsden, 2004) to aid in the development of this soft skill. It also followed the features outlined for intercultural training outlined by Brislin and Yoshida (1994) as well as the IDI training goals.

Table 1. Training goals.

| Brislin and Yoshida (1994)                         | IDI                               |
|--|-----------------------------------|
| Awareness, knowledge and information about culture | Awareness of self                 |
| Attitudes related to intercultural communication   | Awareness of others               |
| Skills or new behaviours                           | Creating bridges between cultures |

Two further steps were part of the training concept. The first was to establish the expectations of the participants regarding intercultural training. As the key concept is awareness, it must be kept in mind that participants needed to be aware of what intercultural training is and these expectations should be available to the trainer before the training. It was also important to have immediate feedback from the participants after the training. This would provide the trainers with a general (although subjective) opinion on how the expectations of the training had been met.

In the third phase, the students were on their placements abroad and they were asked to write an online reflective diary based on twelve guided questions that reflected on different situations and aspects of the five basic dimensions of culture (Hofstede, 1980, 2010). For example, the first week, students were asked to photograph things that surprised them and comment on why it was surprising. This progressed to more complicated diary entries in which students were asked to comment on hierarchies by focusing on who greeted who and how and who introduced them to their workmates at their placement. The idea was to have the students reflect on the questions to develop a greater awareness of the values, beliefs and attitudes (Carroll 1990, Spencer-Oatey, 2004) of the new culture during the placement.

In the final phase, students re-took the IDI online and did a debriefing of the results which often led to a more in-depth interview about their experiences abroad. This interview provided a first-hand opportunity to discuss any issues in detail and provided more information about the intercultural competence development of the students.

### 3. Discussion

During all three initial phases (2012-15) almost all of the pre-service teachers who took the IDI were in the Minimisation Stage with the exception of one or two students each year, who were in the Polarisation Stage. As this test provides two scores, the actual cultural orientation and the perceived orientation, it is interesting to note that all students perceive themselves to be much farther along the IDC than they really are. These results helped pinpoint the state of the intercultural development orientation of

the students and served as a basis for the design of the pre-departure training. As mentioned, the IDI results help focus on development along the IDC and in the Minimisation Stage it places emphasis on understanding of cultural differences. This became the main objective of the pre-departure training during the three pilots as most students in this stage only focus on the commonalities and are often not aware of the differences that can lead to conflicts and difficulties. Therefore, for the pre-service teachers, it was necessary to adjust the teaching materials to maximize these learning benefits. A theoretical framework was presented and the following types of activities were used (Hofstede, Pedersen and Hofstede, 2002; Landis, Bennet and Bennet, 2004):

- a) Culture specific readings that illustrated not only the commonalities but also created an awareness of differences.
- b) Culture-specific simulation games that provided an interactive opportunity to practice new behaviours and experiment with new attitudes and points of view.
- c) Culture-specific role plays where participants take on characteristics of people from a particular culture in order to learn how to interact in specific situations with members of that culture.
- d) Critical incidents /case studies exercise. These are brief descriptions of situations in which there is a misunderstanding, problem or conflict arising from cultural differences. These are discussed in groups in order to find an explanation/ and determine possible solutions.

While the course was being prepared, the pre-service teachers were asked to complete a short questionnaire on their expectations regarding intercultural training as this was meant to help in the design of the course. Most students simply expected to get tips on what to do or say, general things that could be applied to every situation. It was also important to create a reasonable correlation between the training time and the training activities. The model assigned four hours for training. In the case of the pre-service teachers, due to time-table limitations, it was impossible to do all the training in one day. This was modified to two sessions that lasted two hours. The sessions were done on one morning of two consecutive weeks. The feedback on the training from the students was done after the last session with open questions and commentaries. In most cases students felt that more training could be beneficial as they were not aware of how challenging it could be to become aware of cultural differences.

The online diary was the next phase. Once the pre-service students had reached their placements they began to comment on the questions that had been posted on the platform. These questions become more involved each week going from simple observations of surprising things, actions or situations and descriptions of rituals like greetings and social activities (including eating habits) to more complicated descriptions of the organization of the schools, the use of time for meetings, scheduling issues and even whether permission was necessary for breaks, etc. The diary ended with an open question that invited students to reflect on a situation that confused them or led to a conflict. These questions appeared each week and stayed open so that students could continue their reflection over time or add comments at a later stage of the placement. This was often the case, and the last question especially provided details which clearly illustrated the developing process of awareness of the students. This phase of the model served in many of the cases as a foreshadowing of the student progress in the acquisition of intercultural competence (Henderson et al., 2013).

In the last phase, the students took the IDI upon their return to university after the placement. During the three years, in 72%-85% of the cases, a higher score – albeit sometimes small- corroborated the increased acquisition of intercultural competence. However, in the other cases a lower score demonstrated a step back in the development of this competence. For these students, the debriefing provided some clues on why this had happened. It appeared that these students were initially on the lower edges of the Minimization Stage and the placement abroad proved to be exceedingly challenging. Another unexpected feature of the debriefings highlighted the difficulties some students had in explaining the outcomes they had achieved during their placements abroad.

#### 4. Conclusions

The four phase model of the pilot programme that was used to aid students in the acquisition of intercultural competences was an adequate framework for this purpose. The small number of pre-service teachers that could participate on these types of placements resulted in a much longer study than had originally been planned. This was deemed necessary to have a better insight into the application of the model and to be able to have more data to analyze.

The use of the IDI provided an overview of the student's positions along the IDC. The concentrated number of students in the Minimization stage every time meant that the focus of the training was similar for each group along the length of the pilot programme. It would be necessary to do more research to ascertain if a larger group would provide a more ample range of scores and this would necessarily affect how pre-departure training would be planned. The expectations of students about the

training in many ways reflected actual cultural orientation stage of the groups (Minimization), as most students expected general tips and advice rather than a focus on the differences in cultures. Over half of the students suggested the need for more training after the initial four hours in the feedback after the course. This has been taken under consideration for the next pilot.

The diary proved to be a rich source of information as the contributions demonstrated how students perceived and then managed or mismanaged what was happening around them. The fact that it was possible to go back to a question and add more commentaries further illustrated the reflective processes of the students. The lack of detail, or superficial analysis in some cases, indicated a possible step back in the development of intercultural awareness. More research would need to be done to ascertain a direct correlation between these two.

Lastly, the debriefing sessions and the second IDI were useful in confirming a competence gain or loss, and in clarifying the possible causes for both. This was especially important in the case of a negative shift. The incidence of students at the lower edges of Minimization who got lower scores on the IDI needs to be studied further. The surprising factor that was not considered was the inability of students to adequately describe what they had learnt. This points to a new issue that should be addressed as students should be able to explain what outcomes they have achieved on their pre-service teaching placements abroad; therefore, more work need to be done in this area.

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## **COLLABORATIVE LEARNING FOR ENHANCING PRACTICAL SKILLS FOR PATIENT-FOCUSED INTERVENTIONS IN GAIT REHABILITATION AFTER ORTHOPEDIC SURGERY**

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### **Abstract**

The present paper presents new approaches in orthopedic training with the use of a Learning Management System delivered through the Internet within the framework of COR-skills project. COR- skills is an EU funded project under ERASMUS+ that started in December 2015 and will finish in December 2017, based on collaboration between hospitals and Higher Education Institutes and aiming to develop, test and adapt a continuous vocational educational programme, developed on an exhaustive needs analysis and focusing on a “real-life” transnational approach. One major output in our project is the development of the Guidelines of operational standard procedures in lower limb orthopedic surgery. OrthoGuidelines is an online information resource providing up-to-date treatment guidelines to orthopedic surgeons and professionals. The guidelines contains 12 standard procedures for hip, knee and ankle surgery which will be proposed for implementation in the medical world of work from participant countries. The innovation consists in development of procedures that will allow to advance the physician-patient communications process and enhance the diagnosis and treatment of musculoskeletal conditions. The recommendations associated with each procedural step are aligned to the existent medical evidence, as for each procedure there are correspondent videos, capturing in real practice the maneuvers presented in the guide, enabling the user to watch the procedure that is presented in the text and ensuring a better connection between knowledge and skills development.

**Keywords:** *Online education, lower limb orthopedic surgery, guidelines, standard procedures.*

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### **1. Introduction**

The Recommendation of the EU Parliament and of the Council of the Establishment of ECVET are taking place in a framework in which there is a serious need of complementarity between vocational training and higher education. Increasing the quality of vocational skills requires the development of world-class VET systems. EU Commission Communicate on Rethinking Education (2012) underlines that increasing transversal and basic skills alone is not sufficient for growth and competitiveness and vocational education must be able to react to the demand for advanced vocational skills. Implementation of problem-based learning and e-Learning are important part of the recommendations (Karle H, 2000; World Federation For Medical Education, 2015).

The need for harmonization development of an unitary system in medical education across Europe with common standard procedures is a well known fact. Orthopedic surgery remains at the center of the healthcare reform debate, with rising procedure volumes, high utilization of expensive (and in some cases unproven) technologies, substantial regional variation in practice patterns, concerns about inappropriate over-utilization of certain orthopedic interventions, and widespread scrutiny regarding the relationships between orthopedic surgeons and the medical device industry (Brighton, 2009). Another important aspect is that medical interventions are not equally received and with the same benefits by all patients. Sinclair et al (2015) reported that standard procedures are not all the time effective, as each patient has its own particularities, so there is an urge need to adapt medical procedures by patient focused interventions.

A growing number of reports draw attention to the need of adjustment of the offer in medical education to labour market needs and the knowledge-based society (Swanwick, 2008). More, Koh J. & Dubrowski A. (2016) underlined that despite the well known fact that lifelong learning is an essential

trait expected of every medical doctor. many physicians are not engaging in lifelong learning, due to different reasons, among which the lack of time is essential.

Lansky and Milstein (2009) underline that improving quality of care in orthopedic protocols and techniques is of increasing importance to payers, hospitals, surgeons, and patients. In the end, care will only be improved if these data are used to define methods for innovating care systems that deliver better outcomes at lower or equivalent costs.

In these circumstances we decided to develop the COR-skills project that addresses to Vocational Education on higher education level. COR- skills which stands for “Collaborative learning for enhancing practical skills for patient-focused interventions in gait rehabilitation after orthopedic surgery” is an EU funded project under ERASMUS+ that started in December 2015 and will finish in December 2017. Our Strategic Partnership is supporting a project-based collaboration between hospitals and HEIs, to develop, test and adapt a continuous VET programme, based on an exhaustive needs analysis and focusing on a “real-life” transnational approach. The countries participating in the project are Romania, Bulgaria, Turkey, Greece and Denmark.

We are committed to providing the highest possible quality research products to aid in both education and applied clinical decision making. In addition, we hope to stimulate interest in solving clinical problems in the field of orthopedic surgery and to offer personalised support both for the learners but also for the clients (patients). In order to attain these goals we intend to develop an interdisciplinary on-line platform with specific learning tools and content, supporting participants in acquisition of skills in the field of orthopedics and rehabilitation. In this way we aim to stimulate resident learning by new approaches, as the development of an innovative e-training method which is able to provide the trainees with a range of case studies and an advanced training curriculum. This will function as a virtual medical environment, similar with the work place and help attune curricula to current and emerging labour market needs and equip the specialists with required skills.

The project is under development and at this time we achieved a major output in the development of the Guidelines of operational standard procedures in lower limb orthopedic surgery. OrthoGuidelines is an online information resource providing up-to-date treatment guidelines to orthopedic surgeons and professionals.

## 2. Methods

The present clinical guideline was developed by a Work Group within the COR-skills partnership and is provided as an educational tool based on an assessment of the current scientific and clinical information and accepted approaches to orthopedic surgery. It is not intended to be a fixed protocol as some patients may require more or less treatment. Patient care and treatment should always be based on a clinician’s independent medical judgment given the individual clinical circumstances.

The present material represents the best practice of experts within The Clinical Emergency Hospital Bucharest, Romania, University of Medicine and Pharmacy Carol Davilla Bucharest and Mersin University from Turkey, one of the best known and most respected orthopedic units in the correspondent countries.

The didactic team began working on this guideline by constructing a set of preliminary recommendations. These recommendations were based on a previous Research and Reporting for the Current State of Art in Orthopedic Surgical Procedures and Highlighted Needs in Medical Education.

The purpose of research report was to identify the milestones and overall approaches regarding standard surgical procedures in lower limb pathologies and the training requirements for the development of basic and new skills in orthopedics in direct connection with the needs of the users. First step in the process included reviewing the results of the evidence analysis by literature research, aiming to:

- select the most common surgical protocols in all participant countries and the correspondent rehabilitation procedures
- make first steps in standardization of protocols
- develop interdisciplinary approach (orthopedics-rehabilitation).

In order to attain these objectives the partnership reviewed different abstracts, recalled pertinent full articles for review and evaluate the studies meeting the inclusion criteria. They also abstract analyzed, interpreted and/or summarized the relevant evidence for each standard procedure.

Upon completion of the systematic reviews, each medical partner registered 30 examples of orthopedic surgical procedures in lower limb pathologies and 30 examples of rehabilitation procedures after surgery in lower limb pathologies. From these procedures, 12 orthopedic surgical procedures in lower limb pathologies and 12 correspondent rehabilitation procedures were proposed to be negotiated in the partnership as eligible procedures for the Guide of operational standards.

In choosing the procedures we also took into account a national research, study and analyses on labour market demands for all participant countries. These reports reflect needs' identification for target groups in each participant country on the use of the proposed procedures at work place, based on surveys and questionnaires addressed to the target group and potential users. Analysis of learners' actual knowledge and of knowledge needs for identifying the current performances and gaps was carried on, as well as analysis of the VET in orthopedics in participant countries, correlated with the use of orthopedic procedures in practice. Based on the national reports a transnational summative report was drawn, aiming in establishment of common standards and identification of the differences in usage of the protocols from one country to another. The report collected information not only on needs, but also on specific sectorial impact, country, differences and offers a reflection on the envisaged impact and identifies the ways to introduce new and consensually agreed basic protocols into the academic medical field (university) and the medical world of work (hospitals).

All these reports can be consulted on COR-skills web site on <https://www.cor-skills.org/>.

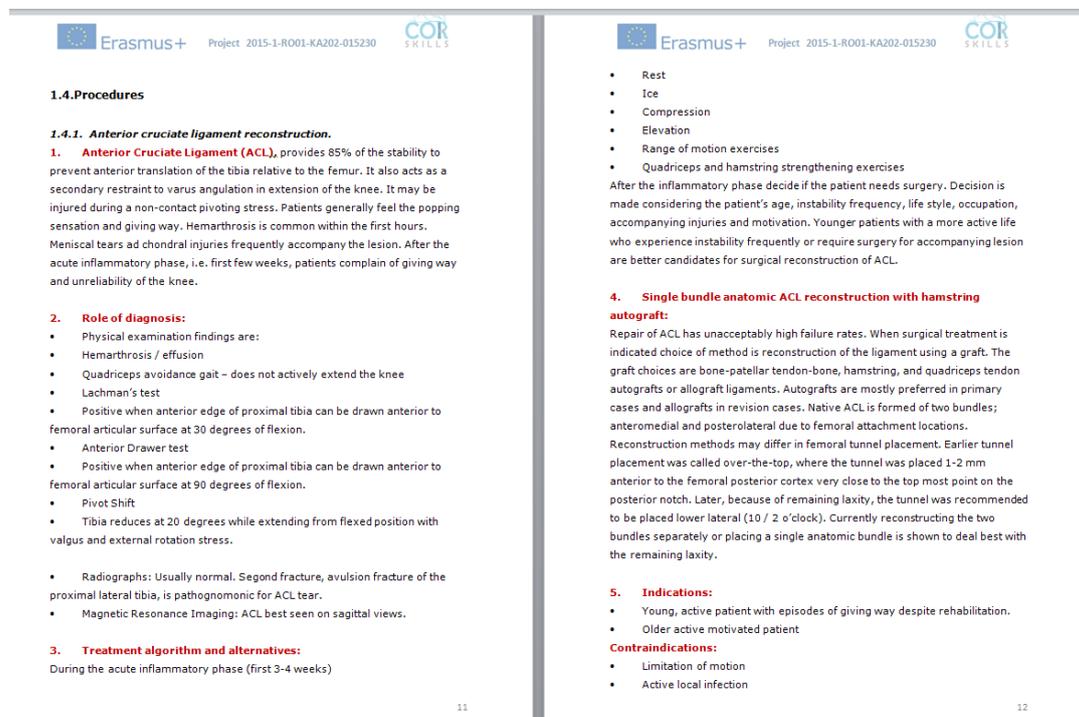
Each standard procedure has a correspondent video, capturing in real practice the maneuvers presented in the guide. Provisions to ensure that the rights of patients are protected when filming occurs were taken in accordance with medical ethical specific issues.

Evaluation of research/needs reports and Orthoguidelines was carried on by satisfaction questionnaires addressed to potential trainees – orthopedicians on different levels of training and different working places (specialists, residents in course of gaining competence, public or private health institutions). The quantitative indicators followed were the number of filled questionnaires and the recorded number of respondents was 123 for all participant countries. The qualitative indicators were represented by the level of satisfaction of respondents that was over 80%. Also the guideline was submitted for peer review to an advisory expert group. In this way the Method of Guideline Validation included External Peer Review and Internal Peer Review.

### 3. Results

The Guidelines of operational standards in lower limb orthopedic surgery contains 12 standard procedures for hip, knee and ankle surgery and correspondent videos in English. The text is in form of a book, in which the recommendations associated with each procedural step are aligned to the existent medical evidence (figure 1) and is available on Cor-skills web site <https://www.cor-skills.org/>.

Figure 1. The Guidelines of operational standards in lower limb orthopedic surgery – text.



The easy to follow guidelines enable practitioners to look up a pathology and quickly see the recommended orthopedic strategy. Phases of treatment are defined to clearly show goals, precautions, treatment strategies and criteria for surgery.

Each presented procedure includes:

- the rationale for the procedure
- role of diagnosis - advanced imaging and assessment
- treatment algorithm and alternatives
- preliminary recommendations, indications and contraindications for surgery; risk and harms
- preoperative planning and the preparation of the patients for surgery
- surgical procedure - step by step description (video)
- early postoperative care
- potential short term complications
- communication with patients (pre and post surgery)..

For each procedure there are correspondent videos, capturing in real practice the maneuvers presented in the guide, enabling the user to watch the procedure that is presented in the text and ensuring a better connection between knowledge and skills development. Also the video material will create support for autonomous learning practical skills for the trainees. The videos are available on the COR-skills e-learning platform where access is restricted by password (figure 2).

Figure 2. The Guidelines of operational standards in lower limb orthopedic surgery - video.



The videos are composed of a full surgical case operation. The raw footage is obtained by recording the surgery from the beginning to the end. The video is edited to discard redundant, focus losing, scenes and the important steps are joined to form a shortened but demonstrative video. The steps of the surgery are gathered from several widely accepted text books and are organized as subtitles to the video. The subtitles are embedded into the corresponding time images.

The pictures for the case studies and self assessment quizzes are obtained from institutional archives. Patients are informed and consent are signed but still any personal information is erased from the pictures. The pictures are digital images of the case which are mostly composed of radiological images. The images demonstrate the key features of the case to be presented (figure 3).

Figure 3. The Guidelines of operational standards in lower limb orthopedic surgery - case study.



#### 4. Conclusions and Discussions

We have to keep in mind that the field of orthopedics is an extremely competitive field. New technologies are constantly being introduced with the promise of improved patient outcomes, but often with limited information. Normal gait is essential for daily living and the number of pathologies that

affect gait is increasing (accidents, aging). In orthopedics in particular, after surgery, a long and difficult rehabilitation process follows in order to regain normal gait and requires interdisciplinary team approaches. More, each patient has its own properties, so standard procedures are not all the time effective and need to be adapted. This guideline is not intended to be construed or to serve as a standard of care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. We assume that the OrthoGuidelines can provide busy orthopedic surgeons and rehabilitation professionals (who do not have the time to keep up with and critically evaluate current literature) with succinct information that enables them to rapidly determine what is and what is not known about any given medical protocol.

The innovation consists in development of procedures that will allow to advance the physician-patient communications process and enhance the diagnosis and treatment of musculoskeletal conditions. This will encourage critical thinking of the trainees, reinforced quality of medical services, increasing the level of health care, decreasing the rehabilitation time and health costs, development of inter-sectorial and international collaborative cultures by sharing of knowledge and ideas from teaching to work-place.

Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgment must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgment should only be arrived at following discussion of the options with the patient, covering the diagnostic and treatment choices available.

This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician and other healthcare practitioners.

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# EDUCATIONAL BLOGS AND NARRATIVES TO DEVELOP A PROFESSIONAL NOTICING: EXPERIENCES OF PRE-SERVICE SPANISH LANGUAGE TEACHERS

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## Abstract

The following paper presents a study in which Education students at the University of Alicante used narratives and blogs in their development of professional noticing regarding their own teacher education. These tools were chosen as they can aid students to identify and reflect on the learning contents and teaching objectives in the classroom. In this study, one of the specific goals for Primary Education and Master's students is to identify how learning takes place in the area of Spanish Language and Literature. Firstly, the narratives of a group of Primary Education pre-service teachers are analyzed during their school placements. The narratives allow us to see how students perceive the direct experience of giving a real class of Spanish Language and Literature during their placements. Students compile and describe teaching situations where the expected subject contents are presented and taught in the Primary classroom. The narratives explore the differences between the theory and the reality of teaching in the Primary classroom. Secondly, the Master's students' blogs during their placements are analyzed. These blogs offer multiple perspectives of learning situations in the Spanish Language and Literature classroom and collectively foster teaching competences from different perspectives as multiple contributors discuss and describe classroom experiences. In both cases, the need to foster a professional vision on teaching is fostered through the use of narratives and blogs. The analysis of these show how pre-service teachers identify the development of the competence in linguistic communication, reading comprehension and literary education in the subject of Spanish Language and Literature in Primary and Secondary school students.

**Keywords:** *Spanish Language and Literature, blogs, narratives, professional noticing.*

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## 1. Introduction

In initial teacher training, new educational perspectives in the 21<sup>st</sup> century present multiple transformations regarding how to manage classroom interaction and the description of the teaching-learning process. In addition, ICTs have introduced new educational approaches such as Connectivism (Siemens, 2006) where technology and Internet are fundamental tools in the learning process. These changes require greater flexibility on behalf of teachers who need to be aware of what is happening around them to effectively give class (Mason, 2002). The ability to identify different classroom situations is an important requirement in the initial training of teachers so that they can help students develop specific competences. Subsequently, the conceptualization and the identification of contexts to develop a professional noticing becomes fundamental (Mason, 2002; van Es, 2010; van Es and Sherin, 2002). This competence allows future teachers to observe and reflect on teaching-learning situations from a professional standpoint during their pre-service training.

In teacher training programmes in Early Childhood Education, Primary Education, and Secondary Education, this ability to identify the contexts for the development of this competence becomes essential. Recent research (Jacobs, Lamb and Philipp, 2010; Fernández, Llinares and Valls, 2012; Sánchez- Matamoros, Fernández and Llinares, 2015) on this competence (professional noticing) show that the development of this competence is not an easy task for future teachers and illustrate different contexts to develop this competence. Much of this research is in the field of Mathematics (Ivars and Fernández, 2015) however, this new study applies this approach to the area of Language and Literature. This competence is structured on three interrelated skills (Jacobs, Lamb and Philipp, 2010):

- Identify the strategies used by students
- Interpret the understanding manifested by the students

- Decide how to respond bearing in mind the understanding of the students

The difficulties in the development of professional noticing, the descriptions of the narratives and the multiple possibilities of educational blogs provide an ample field for research that can aid preservice teachers in the field of Language and Literature.

The conceptualization of the teaching competence (or professional noticing) has been discussed in the literature in which Mason (2002) highlights four main aspects:

- I. intentional noticing,
- II. marking and recording,
- III. recognizing choices, and
- IV. (validating with others).

In addition, van Es and Sherin (2002) summarise the necessary skills into three:

- A. identify the relevant aspects of a situation
- B. use the knowledge of the context in which these occur to reflect on the interactions, and
- C. make connections between what has occurred in the classroom and the general principles of teaching-learning processes.

Both perspectives highlight the importance of the identification of relevant aspects in teaching-learning situations in different subjects. Additionally, this also permits these to be interpreted based on previous knowledge acquired in the degree programme which helps in making decisions. Pre-service teachers should be able to draw from these specific descriptions in the classroom to reach an interpretation based on evidence of real learning.

## 2. Methods and Objectives

This study is part of the research project “*Cómo potenciar el desarrollo de la competencia “una mirada profesional” en la formación inicial*” (GV/2014/075) funded by the Conselleria d'Educació, Cultura i Esport of the Generalitat Valenciana, in which four researchers proposed different ways of developing professional noticing in pre-service teacher placements in Early Childhood Education and Primary Education (Fernández, Iglesias, Lozano and Rovira, 2017). In the study, the narratives of 54 students were analysed (from both Early Childhood and Primary Education) during their second placements. This placement period is part of the final year of the degree programme. In the observation phase, the participants described narratives (Webster, 2007) in which teaching-learning situations were identified relative to Mathematics competence and Linguistic competence (November-December 2014). In a later period, the narratives of two groups of students on their second placement were used (44 students, November-December 2016) specifically centered on the contents related to the Linguistic and Literature competence. These school narratives illustrate the richness and the variety of stories and interpretations of the participants in the educational context (Huber, Caine, Huber and Steeves, 2013), especially during placement periods. Narratives are a primary source of meaning of the human experience (Polkinghorne, 1988 cited in Bolívar, 2002) and it allows us to understand how teachers organise their work and how they act in professional contexts (Huchim and Reyes, 2013). Moreover, as these narratives give teachers the opportunity to reflect on teaching, they also show how this relates to their own learning (Connelly and Clandinin, 1990).

Simultaneously, research was done on the use of educational blogs as a tool to develop professional noticing (Rovira-Collado 2016). In this study, the contributions of students to blogs as part of the subject *Investigación, Innovación y Uso de las TIC en la Enseñanza de la Lengua y la Literatura*, in the Master's programme were analysed (<http://didacticalenguayliteraturaua2015.blogspot.com.es/> (57 students, 8 student blogs, more than 400 posts) <http://didacticalenguayliteraturaua2016.blogspot.com.es/> (44 students, 7 student blogs, more than 300 posts).

This analysis was based on indicators of the development of professional noticing from a different group of students, the majority of these students hold an undergraduate degree in Spanish Studies. These students have less training in teaching methodology however, they teach at a higher level (secondary education).

## 3. Results

In the first part of the study, 12 narratives were selected from the second group of 44 during the placement as models of description, reflection and educational activity in the area of language and Spanish literature. In all of them adequate subject matter knowledge is evident and there is an acceptable description of the teaching-learning process. The following general responses can be seen in the structures of the narratives:

- a) Describe the situation:
  - Adequate description of the chosen language and/or literature activities.
  - Identification of learning by the student.
  - Examples of teaching acts.
- b) Interpret the situation:
  - Compilation of the specific objectives in the area of Language and Literature worked in the classroom.
  - Identification of examples of the teacher and questions and answers of the students which evidence the learning process, in other words, that the students understand the content that is being explained.
  - Completes the interpretation highlighting other basic competences and information related to the official curriculum.
- c) Complete the situation:
  - Proposal of complementary activities to better the development of the linguistic communication competence and the reading competence.

In the second field of study, 15 blogs (700 posts) written by students in the Master's programme were analyzed in which over 100 contributions demonstrated evidence of the development of professional noticing. For example, in searches for educational material on the internet such as in Slideshare, appropriate links are identified. In addition, the research and the review of educational spaces also illustrate this professional noticing. Lastly, the reflections by the students on their current abilities and their future needs show an interest in the development of their professional competence.

#### 4. Discussion and Conclusion

The wide range of results show many differences. Firstly, the narratives written by the students during the placement are a structured instrument based on a theoretical corpus which allows for a more defined analysis in the acquisition of professional noticing and the acquisition of specific contents of the subjects in the area of Language and Literature. However, the blogs analyzed showed this professional competence in the multiple entries where it became necessary to apply the narrative model to structure the results. Secondly, the differences in the previous training and the educational stage under study (Primary or Secondary Education) is also reflected in the results. The narratives from Primary pre-service teachers have a higher content in methodology description, with the objectives, contents and types of activities clearly described. In contrast, the blogs written by pre-service Secondary school teachers show a greater interest in the contents of the subject of Spanish Language and Literature. Much more attention is given to the topic than the methodology which shows a need to delve further in the aspects of teacher training. As previously mentioned, this study is based on studies from other areas, mainly the teaching of Mathematics. The results of this study provide insights to possible further research in the field of professional noticing in the teaching of Language and Literature. This includes doing more research at higher levels, mainly the stage of pre-service Secondary Education teachers who follow a different educational path to become teachers and who teach more complicated linguistic and literary content, in order to map out the routes of professional noticing.

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## REHABILITATION GUIDELINES OF OPERATIONAL STANDARD PROCEDURES IN REHABILITATION AFTER LOWER LIMB ORTHOPEDIC SURGERY

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### Abstract

Rehab Guidelines is an online information resource providing up-to-date treatment guidelines to medical doctors – residents and specialists in physical and rehabilitation medicine and to rehabilitation professionals. We decided to develop the Rehab Guidelines of operational standard procedures in rehabilitation after lower limb orthopedic surgery, as one of the major outputs of COR-skills project, funded by ERASMUS+ and addresses to Vocational Education and training (VET) on higher education level. Designed to help therapists provide post-surgical rehabilitation based on best practices and evidence-based research, this comprehensive reference presents effective guidelines for rehabilitation postsurgical interventions. Our Strategic Partnership involves a diverse range of partners in order to benefit from their diverse experience, profiles and specific expertise to produce relevant and high quality project results. The consortium includes hospitals, and higher education institutions well known in the field, with consistent experience and strong networks with their target groups from 3 countries (Romania, Bulgaria and Turkey) with high qualified specialists in orthopedics & traumatology and in physical & rehabilitation medicine with a longstanding reputation for providing student- focused programs for health education. This guideline introduces a brief picture of 12 selected standard rehabilitation operational procedures after lower limb orthopedic surgery for hip, knee and ankle, aiming to develop basic skills for medical specialists in rehabilitation (theoretical and practical skills for assessment, decision, and rehabilitation treatment in different pathologies). For each procedure, there are correspondent videos, capturing real practice maneuvers presented in the guide that will create support for autonomous learning practical skills for the trainees. Each presented procedure includes: the rationale for the procedure, role of diagnosis, preliminary recommendations, rehabilitation timing and methodology, early postoperative exercises and prophylaxis of complications, intermediate exercise program, advanced exercises and activities, complex PRM program and communication with patients. The easy to follow guidelines enable practitioners to look up pathology and quickly see the recommended rehabilitation strategy. Phases of treatment are defined to clearly show goals, precautions, treatment strategies and criteria for rehabilitation. This summary of recommendations is not intended to stand alone. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician and other healthcare practitioners. We aim that this partnership between education and employment will stimulate the flow exchange of knowledge between higher education and hospitals / medical clinics and will lead to the development of high quality VET with a strong work-based learning component.

**Keywords:** Vocational education, rehabilitation, guidelines, procedures, lower limb.

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### 1. Introduction

The Recommendations of the EU Parliament and of the Council of the Establishment of ECVET are taking place in a framework in which there is a serious need of complementarity between vocational training and higher education. Increasing the quality of vocational skills requires the development of world-class VET systems. The need for harmonization development of an unitary system in medical education across Europe with common standard procedures is a well-known fact.

In orthopedics, in particular after surgery, a long and difficult rehabilitation process follows in order to regain normal gait and requires *interdisciplinary & transdisciplinary team* approaches [Yoshinov, Koleva, Paskaleva et al., 2011]. Rehabilitation should be initiated as early as possible – with the goal to promote mobility and function. The initial emphasis should be on restoration of independence in walking and in activities of daily living (ADL), for example, transferring, washing, dressing, and toileting. Balance and gait are essential components of mobility and are useful predictors in the assessment of functional independence [White Book on Physical and Rehabilitation Medicine in Europe, 2007].

Collaboration between orthopedic surgeons, and rehabilitation professionals should be sought to assist in management and medical rehabilitation. The benefits of shared postoperative management by orthopaedic surgeons and rehabilitation professionals include trends towards earlier functional independence, reduced length of stay, improved management of medical conditions and decreased future need for institutional care, including nursing home care.

Thanks to the growth of educational technologies and the Internet, the number of e-Learning resources available to educators has dramatically increased [Dochev, Pavlov & Yoshinov, 2000].

A great number of educational institutions provide a form of web-based learning starting from as early as comprehensive schools and getting as far as university programmes for undergraduate and postgraduate students [Dochev, Pavlov & Yoshinov, 1999, 2000; Yoshinov, Koleva & Garnizov, 2011].

The number of participating countries is increasing, more aspects of higher education are included and the number of activities and projects is growing.

Medical education is considered by many as one of the most conservative education providers in terms of methods used. Although in other specialties, especially technical education, computer assisted education has long been integrated into educational curriculum, in medical education this happens sporadically.

A growing number of reports draw attention to the need of adjustment of the offer in medical education to labor market needs and the knowledge-based society.

In these circumstances we decided to develop the COR-skills project that addresses to Vocational Education on higher education level. Our Strategic Partnership is supporting a project-based collaboration between hospitals and HEIs, to develop, test and adapt a continuous VET program, based on an exhaustive needs analysis and focusing on a “real-life” transnational approach.

We aim to stimulate resident learning by new approaches, as the development of an innovative e-training method which is able to provide the trainees with a range of case studies and an advanced training curriculum. This will function as a virtual medical environment, similar with the work place and help attune curricula to current and emerging labor market needs and equip the specialists with required skills, by developing active cooperation between HEI and partners from outside academia: hospitals, medical centers, research centers.

We are committed to providing the highest possible quality research products to aid in both education and applied clinical decision making. In addition, we hope to stimulate interest in solving clinical problems in the field of rehabilitation and to offer personalized support both for the learners but also for the clients (patients).

Implementation of individualized health care approaches is one of the major innovations of this project, encouraging critical thinking of the trainees, reinforced quality of medical services, increasing the level of health care, decreasing the rehabilitation time and health costs, development of inter-sectorial and international collaborative cultures by sharing of knowledge and ideas from teaching to work-place.

## 2. Design

The guidelines contain 12 (twelve) standard procedures for post-surgery rehabilitation in selected pathologies of hip, knee and ankle which will be proposed for implementation in the medical world of work from participant countries. The innovation consists in development of procedures that will stimulate the physician-patient communications process and enhance the diagnosis and treatment of musculoskeletal conditions.

The recommendations associated with each procedural step are aligned to the existent medical evidence, as for each procedure there are correspondent videos, capturing in real practice the maneuvers presented in the guide, enabling the user to watch the procedure that is presented in the text and ensuring a better connection between knowledge and skills development. Also the video material will create support for autonomous learning practical skills for the trainees.

The easy to follow guidelines enable practitioners to look up pathology and quickly see the recommended rehabilitation strategy. Phases of treatment are defined to clearly show goals, precautions, treatment strategies and criteria for rehabilitation.

Each presented procedure includes some principal elements: *the rationale for the procedure ; role of medical diagnosis and functional assessment; preliminary recommendations; rehabilitation timing and methodology (steps) ; early Postoperative Exercises and Prevention of complications, intermediate Exercise Program ; advanced Exercises and Activities ; communication with patients.*

### 3. Objectives

The major output in our project is the development of the Guidelines of operational standard procedures in rehabilitation after lower limb orthopedic surgery. Rehab Guidelines is an online information resource providing up-to-date treatment guidelines to medical doctors – specialists (in Orthopedics & Traumatology /OT/, and in Physical and Rehabilitation Medicine /PRM/), and to professionals (physiotherapists, ergotherapists, etc.).

The guidelines contain 12 standard procedures for post-surgery rehabilitation in selected pathologies of hip, knee and ankle which will be proposed for implementation in the medical world of work from participant countries. The innovation consists in development of procedures, designated to promote the physician - patient communications process, to enhance the diagnosis and to precise the treatment of musculoskeletal conditions.

### 4. Methods

The present clinical guidelines are created as an educational tool and were developed by a Work Group within the COR-skills partnership. After a detailed bibliographic search we effectuated an analysis of the current scientific and clinical information and accepted approaches in orthopedic surgery and in post-operative rehabilitation. The result was the creation of a *prototype Protocol*, not intended to be a fixed protocol as some patients may require more or less treatment. Patients' care and treatment should always be based on a clinician's independent medical judgment given according actual and individual clinical circumstances.

Our Strategic Partnership involves a diverse range of partners in order to benefit from their different experiences, profiles and specific expertise to produce relevant and high quality project results.

The consortium includes hospitals, and higher education institutions well known in the field, with extended experience and strong networks with their target groups from 3 countries with high qualified specialists in Orthopedics and Traumatology (OT), and in Physical and Rehabilitation medicine (PRM), with a longstanding reputation for providing student-focused programs of health education. Issues taking into consideration were: competence and thematic expertise in the field, relevant experience in working in transnational context, specific interest in the development of medical skills for health professionals in the fields of OT, PRM and post-operative rehabilitation..

The structure of the partnership based on the complementary of HEIs and hospitals helps to ensure the necessary competence and adequacy of the skills developed but also aiming to contribute in this way to the development of inter-sectorial and international collaborative cultures by sharing of knowledge and ideas from teaching to work-place, helping medical vocational education to meet the current and future labor market needs.

This partnership between education and employment will stimulate the flow exchange of knowledge between higher education and hospitals/medical clinics (world of work) and lead to the development of high quality VET with a strong work-based learning component.

The present material represents the best practice of experts – representatives of correspondent rehabilitation schools of Romania and Bulgaria; using the clinical bases in respected rehabilitation departments in correspondent countries: Clinical Hospital Filantropia – Craiova (Romania) and Sainte Anna University Hospital – Sofia (Bulgaria).

During elaboration of the guidelines, we applied principles, defined by the American psychological association: standardization across guidelines, clear structure and instructions. We used some practice guidelines attributes: respect for human rights and dignity, delineation of scope, avoidance of bias, educational value, internal consistency, flexibility, basis, feasibility, aspirational language, clarity, and compatibility [American Psychological Association, 2002].

The didactic team began working on guidelines by constructing a set of preliminary recommendations. These recommendations specify [what] should be done in [whom], [when], [where], and [how often or how long]. In the development of the present guidelines we used the WHO criteria [World Health Organization, 2017] (Fig 1.)

Figure 1. WHO criteria for technical guidelines development.

| WHO recommended steps in technical guideline development                | Action Taken |
|---|--------------|
| Define the specific issues to be addressed by the guidelines            | Completed    |
| Undertake a systematic search for evidence                              | Completed    |
| Review the evidence available   | Completed    |
| Develop recommendations linked to the strength of the evidence          | Completed    |
| Draft guidelines  | Completed    |
| Discuss and incorporate, where relevant, comments of external reviewers | Completed    |
| Draft final version of the guidelines                                   | Completed    |
| Make recommendations on dissemination strategy                          | Completed    |
| Document the process of guideline development                           | Completed    |
| Test the guidelines through pilot evaluations                           | Completed    |

First step in the process included reviewing the results of the evidence analysis.

The result of the literature research was a report for the current state of art in the field of protocols for orthopedic surgical procedures and rehabilitation procedures after surgery, aiming to:

➤ *select the most common surgical protocols in all participant countries and the correspondent rehabilitation procedures;*

➤ *make first steps in standardization of protocols;*

➤ *develop interdisciplinary and multi-professional approach (OT – PRM).*

In order to attain these objectives the partnership reviewed different abstracts, recalled pertinent full articles for review and evaluate the studies meeting the inclusion criteria. They also abstract analyzed, interpreted and/or summarized the relevant evidence for each standard procedure.

Upon completion of the systematic reviews, each medical partner registered 30 examples of orthopedic surgical procedures in lower limb pathologies and 30 examples of rehabilitation procedures after surgery in lower limb pathologies. From these procedures, 12 orthopedic surgical procedures in lower limb pathologies and 12 correspondent rehabilitation procedures were proposed to be negotiated in the partnership as eligible procedures for the Guide of operational standards.

Evidence-based information, in conjunction with the clinical expertise of physicians from multiple medical specialties, was used to develop the criteria in order to improve patient care and obtain the best outcomes while considering the subtleties and distinctions necessary in making clinical decisions.

## 5. Discussion

Designed to help therapists provide post-surgical rehabilitation based on best practices and evidence-based research, this comprehensive reference presents effective guidelines for postsurgical rehabilitation interventions. Its authoritative material is drawn from the most current literature in the field as well as contributions from expert physical therapists, occupational therapists. A specific video accompanies every procedure, featuring over 200 minutes of video of patients demonstrating various therapeutic exercises spanning the different phases of postsurgical rehabilitation.

This guideline is not intended to be construed or to serve as a standard of care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve.

Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgment must be made by the appropriate healthcare professional(s), responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgment should only be arrived at following discussion of the options with the patient, covering the diagnostic and treatment choices available.

This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician and other healthcare practitioners.

## 6. Conclusions

Rehab Guidelines is an online information resource providing up-to-date treatment guidelines to medical doctors – residents and specialists in physical and rehabilitation medicine and to rehabilitation professionals.

The easy to follow guidelines enable practitioners to look up pathology and quickly see the recommended rehabilitation strategy.

Designed to help medical doctors – specialists in PRM and therapists to provide post-surgical rehabilitation based on best practices and evidence-based research, this comprehensive reference presents effective guidelines for rehabilitation after orthopedic surgery.

We aim that this partnership between education and employment will stimulate the flow exchange of knowledge between higher education and hospitals (OT and PRM clinics & Departments) and will lead to the development of high quality VET with a strong work-based learning component.

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# EDUCATIONAL TECHNOLOGY AS A KEY FACTOR FOR SOCIAL DEVELOPMENT, AS SOCIETY ENTERS TO THE NEXT TECHNOLOGICAL MODE\*

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## Abstract

We can see a global process of changing technological mode that demands specialists for the new branches of Technologies. To make education more effective for preparing future specialists, we need understand future needs that connect with next Technological Mode. To illustrate these tendencies, firstly we will present and discuss how the waves of World economical development described by Russian economist Nicolay Dmitrievich Kondratyev are connecting with requirement of changing educational approaches for the new technological modes. Every technological mode is linked to a specific type of educational system that is prevalent in a given society, as we also argue.

Secondly, we will show correlation between the changing mode and the need to prepare personnel to be equipped to use the new technologies such as bio- and nano-technologies, multimedia-programs and IT technologies used in humanitarian purposes in forecasting and foresight, based on mathematical modeling. We argue that these processes have become the base for development of social system.

**Keywords:** *Strategic purposes of education, economical waves, economical cycles, interdisciplinarity, innovative education.*

## 1. Introduction

Firstly we want to discuss most common things: 1) how the waves of World economical development described by Russian economist Nicolay Dmitrievich Kondratyev are connecting with technological modes and educational patterns 2) how they are creating new opportunities for designing new technologies and the Social development. As result of this connection we can definite and describe every technological mode for every economical wave. New technologies created new opportunities for social life. As a result there appeared not only technological elite, but some new ways for social life too. Creating new technologies demands new types of education. Each of the new technologies needs a new approach in education. Secondly we want to discuss how new models are connected with current education types preparing human resource for new technologies. For example for the last mode we have such technologies as bio- and nano- technologies, multimedia-programs and high humanitarian technologies using forecast and foresight based on mathematical modeling.

We conclude that every technological mode has own basic demands for making main accent for preparing stuff for its. Now we see rising of complicating social systems and complicated technologies too so for the next technological mode educational approach is forming on the new principles of self-organization and interdisciplinarity according to the new needs of society. We want to discuss connection of new social risk with absence of suitable education for new technologies also.

## 2. Design

Education is a base for all technological evolution in social dynamic. It creates new opportunities for a society and its development. Researching society before Technological development Thomas Robert Malthus created a cognitive model of Society with main parameters for it. (Malthus) It is amusing that this model is working for understanding social development till now. Numerous investigations of this model can show the main parameters of future of society, these are usually depend on environmental

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conditions, level of life, demography, technologies and education. These conditions became the main parameters for description of a Society. All other characteristics of any society depend of these main parameters. Influence of each one to a society is very different. Analysis of a social dynamic let us evaluate their significance and education is most significant parameter for social evolution.

Changing of educational approaches according the next technological mode is the focus of our attention. Every mode needs skilful staff for own technologies and education must create ways for it. We see that every technological mode demanded increasing engineering knowledge and skilful but now appearing high humanitarian technologies that helps organize new structures in society.

In this paper we argue that changing educational approaches is necessary for future education. From the one hand the very existence of modern society is critically dependent on the presence of responsible, professional, creative people. So new education and science must be differ markedly from before. From the other hand future depend of contemporary education as never earlier. This processes became base for development of civilization.

We want to discuss next questions: aspects of cognitive model establishing strategic goals of new education; the most important educational subjects and courses and technologies supporting these directions, creation of information support and systems of cognitive centres for the process and monitor the results and choosing learning activity in according with new information conditions and opportunities.

This educational approach connects with creation of mathematical models of real situations which allows guiding the process and monitoring the results. Education gives opportunity society for functioning throw technology working. To make education more effective in preparing future specialists, we need understand future needs that connect with the New Technological Mode.

Education gives opportunity to the society for successful functioning. According to our investigations every technological mode has its own basic technologies. (Malinetskiy) We would like to present the description of technologies that support each of the modes. For the 1st Technological mode it was Textile industry; for the second – they were mechanical engineering, ship building, coal industry, ferrous metallurgy; for the 3-rd they were power engineering industry and heavy industry, steel production, inorganic chemistry; for 4-th they were mechanical engineering, tractor and automotive industry, non-ferrous metallurgy, organic chemistry. 5th mode is the last one of the history of economic waves and is finishing now and it was connected with computers and information technology, bio- technology, production and processing of gas and for the new one, the 6th we need to understand how to make this transformation most correct and effective. Every new technology makes society more complex.

Contemporary society has many different technologies and new humanitarian technologies. Now we have the period of change in technological mode from 5th to the 6th has a very complicated structure and described with many different parameters that let create a mathematical model of social processes.’ Such description is very helpful for understanding processes of social dynamic. These parameters are result of society development and historical progress and we can find hundreds of them for society description. But one of the most interesting result of synergy science that we can receive adequate description with a few characteristic if they are order parameters. This is called soft modeling. We can make phase space where axes are order parameters and see the process of social evolution, because all the main characteristics of society depend on or connect with the order parameters of the society. Order parameters are the leading key variables, which are coming on the system in the process of self-organization. They begin to define the behavior of the entire system in dynamic processes after departmentalization. Social system order parameters reflect in culture. Studying the culture in this direction we can make conclusion about its key variables. For example European culture goes with its roots back to Antiquity. The famous myth about Paris choice between three goddesses, where the goddess Athena suggested him power, the goddess Hera wealth and the goddess Aphrodite love show us main variables of Western culture: power, wealth and love. The social structure and wealth mostly depend on technological mode. Base of social evolution depend on technologies. But technologies depend on opportunity to prepare human resource for its functioning. For cultivation of new technologies we need to have skilled staff. Training personal is connected with educational system and depends on basic educational mode.

### 3. Objectives

**General Aims.** The aim of this article is briefly analyze situation in education field for every technological mode for understanding special moments for the new one.

**Specific Aims.** What kind of education needs for every technological mode let us realize what kind of education necessary for the next technological mode? What educational abilities and opportunities are connecting with the next technological mode?

We explore some mathematical modelling of human being helping to explain the situation with education. Since humanity is undergoing the largest bifurcation (point of changing historical process),

the changing of educational process becomes a subject of investigation. We want to find the ways how to describe features of the new education for the next technological mode and how it is linked which social changing. Mostly society changed with technological progress that became the origin for social evolution. This evolution comes by waves described by Russian economist N.D. Kondratyev. On the one hand it connects with changing of technologies and on the other hand with a row of increasing social risk after technology damages, emergencies and catastrophes, disasters, calamities.

The description of social development connects with different sciences that why multidiscipline approach is necessary here. We can see how educational policy could change in accordance with changeable situation in the World. We want to show using self-organization for educational processes, to explore and analyze the situation in educational area according with row of factors of increasing complexity of the social world by means of mathematical modeling. We try to formulate some ideas and proposals for changing educational approaches for correspondence them for future demanding. We develop implementation of new approaches for school and higher university education. We consider innovations as a way for design this process.

The methods of knowledge and research for the XXI century, according to our system analysis and calculations then are projected to be dramatically different from the science approaches of the XIX and XX century. There are several reasons for this. We can mention that the main challenges to be faced humanity in the twenty-first century are different from those already resolved.

#### 4. Methods

A new approach to education in this regard was developed in KIAM (Keldysh Institute of Applied Mathematics, named after M.V. Keldysh). We explore and analyze the situation in educational area in accordance with row of key factors that lie at the base of ever increasing complexity of the social world. More specifically, we use self-organization in educational process for selection some order parameters. It allows us to define crucial steps the educational process should involve. As a result we can significantly reduce time for teaching and reach better results in attainment and subject content retention. Methodological base for the project is the theory of self-organization, or synergy. The joint research work has been carried out with our colleagues in RANEPА (Russian Institute of National Economy and Public Administration under the President of Russian Federation in Department of Project Management) and KIAM (Keldysh Institute of Applied Mathematics, named after M.V. Keldysh). The work was carried out in 2013-2016 years, and it was focused on the study and modeling of the educational processes. There are also such tools as research of economical waves and their correspondence to technological modes and education. Special tool are results of mathematical modelling of social processes and mathematical modelling of technological development and studying educational processes.

Contemporary education as the base of receiving skilled personnel was studied by us in several research projects of Funds: Project of the Russian fund for basic research № 15-06-07926 'Modeling, forecast and control of socio-economic development on the basis of interdisciplinary approaches and cognitive technologies' and project of the Russian Foundation for Humanities №15-03-00404 'Implementation of interdisciplinary approaches and reflexive strategies in modern scientific knowledge'. New technologies are complicated and they created many new technological, ecological and social risks.. We concerned the changed education necessity and our point of view has been formulated.

#### 5. Discussion

When we discuss social development we need to realize the dynamics of social processes and conditions of social progress. As the main parameters of society we can consider order parameters were formulated originally by Thomas Robert Malthus. They are the next: dependence of environmental conditions, level of life, demography, technologies and education. All order parameters are very inert. When we try change one parameter we can see that most of others do not change long time and support the future situation. But studying influence of theses parameters thoroughly on the society we definite only two of them creating future opportunities for a social evolution. Only technologies and education make influence to the future but using technologies connecting with prepared and qualified stuff. To realize what kind of stuff necessary to educate we have to understand what kind of technologies will be demanded for XXI century.

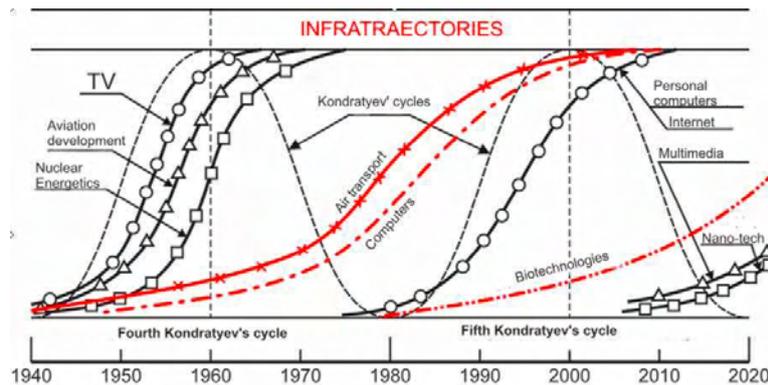
The paper discusses the conceptual and theoretical foundations for society evolution. Technological development depends on economy conditions and the model of economic development was created by Russian economist Nicolay Dmitrievich Kondratyev. He made a description with the waves of World economical development and showed the mechanisms of innovation evolution. The beginning of technological development goes back to 1770.

The first technological mode mostly associated with the appearance of the textile industry and mechanical engineering for the textile industry. The second technological mode characterized with using

of steam engines and the emergence of machine- and steamship- building industry and ferrous metallurgy. Scientific basis for this is the use of Newton's laws and mechanics. The third technological mode associated with using of electric motors and steel allowed to develop the electrical and heavy engineering, to establish production and distribution of steel, power lines began to develop rapidly inorganic chemistry. The fourth mode is a result of creation of internal combustion engines and petrochemicals allowing to create new industries such as automotive, non-ferrous metallurgy, oil refining and organic chemistry, the production of durable goods and synthetic materials and plastic products. Next, fifth technological mode was created by using microelectronic components. Thanks to it there were created new kinds of industries, such as electronics one, fibre optic computer equipment, software, telecommunications, robotics and information services.

Now we have a transition from V to VI economic cycle and from V to VI technological mode.

Figure 1. Economics circles and innovations.



Each of the new technological modes requires of changing of educational approaches for staff and personal for new technologies. If for medieval centuries education mostly was connected on the one hand with trades and handicrafts and on the other hand with liberal, art, humanitarian and religious education. Development of technologies demands mathematical, physical, chemical and other natural science education and then evolution of engineering sciences. From the first modes we can observe new types of education matches to the new technologies.

The basic education for 4th mode was engineering one. The USSR made advanced system of engineering education. Thanks to educational system the country became the leader in the 4th mode. It was prepared about 5 times more engineers that were necessary for economy but according Pareto low only 20 % of them were best for job and its help organize good quality staff for the new technologies. Next technological mode connects with information technologies and changes of education were described by Alvin Toffler in his book 'The third Wave'. (Alvin Toffler)

Education is a very inert field using experience of the past social history but now we need education preparing society to the future. For the New Technological Mode we need prepare staff for the new technologies such as bio- and nano- technologies, multimedia-programs and high humanitarian technologies using forecast and foresight based on mathematical modeling. This processes became base for development of civilization. We argue that the main challenges to be faced humanity in the twenty-first century are different from those already resolved. Social and economic structures are changing just before they were connected with the new technologies. German sociologist Ulrich Beck connected technological modernization with increasing technological, environmental, economical and as a result social risk. He called new society as risk society. (Ulrich Beck)

There are differing opinions as to how the concept of a risk society interacts with social hierarchies and class distinctions. (Caplan p. 6) Most agree that social relations have altered with the introduction of manufactured risks and reflexive modernization. Risks, much like wealth, are distributed unevenly in a population and will influence quality of life.

This educational approach connects with creation of situation model allowing guiding the process and monitoring the results. To make education more effective in preparing future specialists, we need to find and adopt new technologies for education. A new approach to education in this regards was developed in KIAM. We explore and analyze the situation in educational area according with row of factors of increasing complexity of the social world. More specifically, we use self-organization in educational process for selection some order parameters. It allows us to define crucial steps the educational process should involve. As a result we can cut the time for studying and reach good results. The details of this educational technology we represent in our article 'History of European Education from Euclid to Contemporary times: Moving towards Cognitive Limits as the Foundation for Education in the Future' (Malinetskiy. Kapelko).

We want to discuss next questions: aspects of cognitive model establishing strategic goals of new education; the most important educational subjects and courses and technologies supporting these directions, creation of information support and systems of cognitive centers for the process and monitor the results and choosing learning activity in according with new information conditions and opportunities.

## 6. Conclusions

We conclude that education became the most important direction for all society. Education is a product, which creates future and will be demanded tomorrow. So it can be argued that, it is necessary to realize the needs for the society, not only as for today (which is already can be regarded as the past for education), but for tomorrow. These needs are connecting with new technologies for new technological mode. The new technologies demand skill personal and became a great origin of a social risk. To decrease this risk we need to prepare and training people thoroughly for using the new technologies.

In this paper we argue that this educational approach corresponds with a creation of a situational model that allows us to guide the educational process and monitor the results. To make education more effective in preparing future specialists, we need to create and adopt for using new technologies for education.

We explore and analyze the situation in educational area in accordance with row of key factors that lie at the base of ever increasing complexity of the social world. More specifically, we use self-organization in educational process for selection order parameters. It allows defining crucial steps the educational process should involve. As a result we can significantly reduce time for teaching and reach better results in attainment and subject content retention.

The paper will conclude with the discussion of the following questions: what are the key features of the cognitive models that need to be used in establishing strategic goals of education; what are the most important educational subjects and courses and what are the technologies that could best support the delivery; in what ways can the processes and results be best monitored and evaluated; how can we choose the learning activity according to new information, it's conditions and opportunities.

In this paper we argue that changing educational approaches is necessary for future education. From the one hand the very existence of modern society is critically dependent on the presence of responsible, professional, creative people. New education and science must be totally different from previous models. On the other hand future depends on contemporary education as never earlier. This processes became base for development of civilization. We try to show how global problems are linked with achieving main strategic goals for education of the first half of XXI century.

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## TECHNOLOGY (GEOGEBRA) AND MATHEMATICS CREATIVITY IN TEACHING AND LEARNING: A CASE STUDY OF 9<sup>TH</sup> GRADE

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### Abstract

Recent investigations have shown the advantages of using the *software* Geogebra in the mathematics' classroom and in mathematics teaching. More studies have shown that mathematics students' creativity can be promoted through new teaching methodologies and that means implementing tasks and the use of technology. In general, the students they have difficulties in the learning of mathematics and lack of motivation. The contexts using technology to facilitate the learning of mathematical concepts and promoting to mathematics creativity. The attempt to overcome this problem situation was the motivation for this investigation. This study addressed whether a teaching experience performed with dynamic geometry *software* Geogebra, to analyze the participants' conceptions about the use of the software, their contributions and mathematical creativity and to evaluate the mathematical creativity of the participants in the resolution of tasks involving the quadratic function. The study sample was two classes of total 32 participants (12-16 years old) the 9th grade of a public school in the northern region of Portugal, in the school year 2014/2015. The methodology used was qualitative, following a case study and the instrument for data collection was the questionnaire survey and mathematics productions tasks, implemented in mathematics' class. In the data processing it was included the analysis of the responses of students in the questionnaire survey and in tasks, using content analysis by formulating categories of analysis. Analyzing the results, it can be concluded that participants associating mathematics creativity concept the "Innovation", they liked to use Geogebra in class because allowed to learn in innovative way, facilitating the learning of concepts. In evaluated the mathematics creativity, the teaching experience showed that the fluency and flexibility were the dimensions of the most representative mathematical creativity varying in student's responses in different items of the task. This investigation contributed to show wick can the promotion of participants' mathematical creativity with the use of technology and the motivation for the discipline.

**Keywords:** *Mathematics Creativity, Teaching and Learning, Geogebra, 3<sup>rd</sup> Cycle of Basic Education.*

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### 1. Introduction

Technology in mathematics teaching is important and the use of *software's* affording students the teaching of discovery, and ease in understanding concepts (Kebritchi, Hirumi, & Bai, 2010). Moreover the use of Geogebra allows students explore the "world" of Mathematics thinking in a critical and creative way, awakening the interest and motivation for learning mathematics (Arbain & Shukor, 2015). The learning of mathematics with the use of software is learned in a more dynamic way, allows the teaching of content through the discovery, of clarity and the ease in understanding mathematical concepts (Kebritchi et al., 2010) and the technological environment motivates students to teach and learn mathematics (Korenova, 2012).

Geogebra is free *software* and available online, used in the teaching of mathematics, more specifically in the study of geometric and algebraic concepts. This *software* allows easily to the students the creation and manipulation of graphic constructions, to move freely the elements of construction and facilitate the learning of concepts (Goldenberg, Scher, & Feurzeig, 2008). On the other hand, for Barbosa and Prados (2014) o Geogebra promote mathematical creativity and discovery of f new approaches in the teaching of mathematical contents. Mathematical creativity must be promoted in the educational context, to the extent that it helps students in of challenges and problems with which they are confronted daily (Bailin & Siegel, 2003). Although of the curricular programs of the mathematics discipline, do not encourage the development of creativity in the teaching-learning process, students can use their creativity (Ankiewicz, 1995), is appropriate teachers to use contexts that allow the learning of Mathematics in a creative way. In this sense, teacher's role, second Shaheen (2010) is creating opportunities for the development of students' mathematical creativity, and for the use of technology. Besides being a learning resource from the students brand your day-to-day, and for this reason is considered a motivation factor for

learning. The Students' motivation to learn mathematics is favored for type of teaching materials used by the teacher in class (Yilmaz, Altun, & Olkun, 2010).

In the present study mathematical creativity was defined as the ability of the student analyzing a problem situation a different perspective, based in similarities and differences visualization, in generate of multiple ideas and the selection of resolution strategies in situations not known (Laycock, 1970). But recently, Leikin (2009) considers the associated creativity to the representation of original ideas, resolutions or actions, this being related to the innovation (novelty).

The evaluation of students' mathematical creativity it's not an easy task but does not prevent the investigators to recognize importance in the school environment.

The Mathematical creativity in resolving situations is measured by four dimensions that the authors (Conway, 1999; Leikin, 2009; Silver, 1997; Torrance, 1984) identified as: *Fluency* - ability to produce a large number of ideas or possible solutions to a situation, measured by the number of resolutions /correct answers; *flexibility* - capacity to think in the large number of ideas related with methods and strategies, measured by the number of resolutions / different answers; *Elaboration* - ability to develop an idea, measured by adding of a variety details to a previous discovery e *Originality* - ability to create unusual ideas or less frequent, measured by the number of unique or rare answers, in the set of given answers in the group.

## 2. Design / Goals

The present study had as objectives, in a first phase to analyze the participants' conceptions of the concept of mathematical creativity and in a later phase to analyze the contribution of the integration of Geogebra in the mathematical class, in the learning of mathematical concepts and in promotion of the mathematical creativity of the students. In the second part intended to search of evidence of the mathematical creativity through the evaluation of two its dimensions: fluency and flexibility in the students' reasoning processes. Therefore the participants of this study were the students of the 9th grade of two classes of the investigator, constituting itself a case study.

## 3. Methodology

The methodology used in this study was qualitative, interpretive, using the case study and was designed to study the phenomenon of mathematical creativity and the use of technology for context of mathematical task resolution. The option for a methodology of qualitative nature was due to some of its characteristics: the direct source of data is the natural environment, in which the investigator the main instrument of data collection; is descriptive, with reference to the collected data which are descriptive, taking into account the words or images; the data analysis is inductive not wanting the confirmation of previous hypotheses, but to find specific aspects in the data, relating them and grouping them in order to help understanding the phenomenon (Cohen, Manion, & Morrison, 2009). Regarding the interpretative nature of the study was mainly due to the stated by Erickson (1986) for which are interest to in the investigation: the nature of the classroom as an organized means for learning; the nature of teaching as an aspect of the learning environment and the nature of the perspectives and the meanings of students. The option by the case study was based on reported by Stake (1995) of understanding of a particular case, constituted by two classes of the 9th grade of the 3rd cycle of basic education of a Portuguese public school. The data collection process, are used the questionnaire survey and the students' productions in the mathematical tasks, both implemented in the mathematical class. In data analysis, we have proceeded to the content analysis of questionnaire surveys and productions of participants in mathematical tasks (Bardin, 1979). The categories were defined recursively, were not pre-defined although supported by a theoretical framework (Sampieri, Collado, & Lucio, 2003). The categories of analysis are understood by Esteves (2006) as:"(...) the operation by which the data are classified and reduced after they have been identified as relevant in order to reconfiguring responses to the objectives of the study, reconfiguring themselves into categories "(p.109). Accordingly, the numbers of responses of participants were classified and reduced to the questions after having identified relevant words or relevant phrases in order to reconfigure answers to the objectives of the study, obeying the following principles of (Bardin, 1979): homogeneity, completeness, exclusivity, objectivity and relevance.

### 3.1. Participants

The participants of this study were 32 students from the 9th grade, of 3rd cycle of basic education of a Portuguese public school. The group of students was of two class (A and B) in which of the class A are participated 13 students (five of female and eight of male) and of class B participated 19 students (nine of female and 10 of male), of ages understood from 12 and 16 years (mean age about 14 and standard deviation 0.6). On school performance in Mathematics relative the previous school year (2013/2014) the participants had the following results: level one (3%), level two (47%), level three

(25%), level four (16%) and level five (9%). The rating scale was 1 to 5 levels, where the lower rank was is one and the taller was 5.

### 3.2. Questionnaire survey and tasks

In the present stud was elaboration two questionnaire surveys (questionnaire 1 and 2) consisting of two types of questions: one group closed nature, about the characterization of participants and another group of open nature about the conceptions of participants. The questionnaire 1 implemented before the experience was directed for analysis of the conceptions of the participants about in the term mathematical creativity and the questionnaire 2, given at the end of experience had as objective the study of the use the software Geogebra in classroom and the contributions in teaching some mathematical concepts. The mathematical tasks used in teaching about of mathematical concepts through the discovery and the experimentation were withdrawn of teacher space, of the platform of the virtual school (Porto Editora, 2015) and was exploratory and investigative nature. The teaching experience took place in the math classes of two blocks of 90 minutes and one block of 45 minutes, in the 2nd period of the 2014/2015 school year, in unit "Functions" in the content "Quadratic function".

### 4. Results and Discussion

In analysis of participants' answers of eight question (questionnaire 1): "What is for you mathematical creativity?", four categories of analysis were elaborated: "Innovation", "Environment of class" "Imagination" and "Others". In "Others" category were included the answers of the participants, who did not present a specific meaning to the question, as expressions of the gender: "teacher of the discipline", "mathematics classes be creative" and "be mathematically creative". Posteriorly, was counted the number of references and the percentage (%) for each of the categories of analysis, about shown in table 1 below.

Table 1. Analysis categories for creativity mathematics and number of references/(%).

| Categories           | n.º of references/% |
|----------------------|---------------------|
| Innovation           | 16 (50)             |
| Environment of Class | 10 (31.2)           |
| Imagination          | 3 (9.4)             |
| Others               | 3 (9.4)             |

In question number seven and eight (questionnaire 2) the questions were respectively: *Did you like to use Geogebra in math classes in this year? Justifies the answer* and *Did you consider helpful the use of Geogebra in the understanding of concepts in the unit functions, in the topic quadratic function? If your answer was yes or partially, describes the main contributions of Geogebra in learning the concepts*, we proceed in a similar way than in the case of questionnaire 1 of question number eight (table 1). The categories of analysis elaborated for question number seven (questionnaire 2) were three: "Learning", "Software skills" and "Others" and to question number eight were three: "Easy of understanding", "Learning concepts or something new" and "Others". For this category were included responses such as: "because the teacher is cool" and "use of new technologies". The number of references and respective percentage (%) for each of the categories was calculate and is presented in following tables (table 2 and table 3).

Table 2. Analysis categories and reference number/(%) in using Geogebra

| Categories              | n.º of references/(%) |
|-------------------------|-----------------------|
| Learning                | 10 (40)               |
| Software skills         | 8 (32)                |
| Environment class       | 5 (20)                |
| Others                  | 2 (8)                 |
| Total number of answers | 25 (100)              |

Table 3. Analysis categories and reference number/(%) in Geogebra contributions.

| Categories                         | n.º of references/(%) |
|------------------------------------|-----------------------|
| Easy of understanding              | 14 (66.6)             |
| Learning concepts or something new | 6 (28.6)              |
| Others                             | 1 (4.8)               |
| Total number of answers            | 21 (100)              |

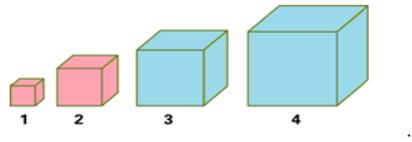
In note, of Table 2, three participants answered "No", two "Partially" and two did not respond. Of Table 3, six participants responded "No", one participant did not respond and four answered "Partially" but did not give an answer.

The results of the participants productions in the task (items 1.1, 1.2.1 and 1.2.2), in the figure on the side (figure 1) refer only to the evaluation of *fluency* dimension since there were no forms of think different and unique in the answers by participants. In *flexibility* dimension will be study target for more comprehensive future investigation because participants in the same answer used different resolution

strategies. As an illustration of the results was selected one exploratory item (item 1.2.1) and another investigation item (item 1.2.2.) for purpose of comparing the fluency in the participants' reasoning processes. Considering the dimensions of mathematical creativity by Conway (1999) the assessment of the fluency dimension is measured by the number of correct resolutions / responses. Its results achieved are presented in table 4 below.

Figure 1. Question 1 (items 1.1., 1.2. and 1.2.2).

1. Observes the figure next in which is represented a sequence of cubes. Consider as unit, the edge length (x) of the cube 1. Edge piece of each cube has a unit the more than the previous cube.



- 1.1. Fills in following table 1:

| Edge Measure of the cube (x) | Perimeter of one face f(x) | Area one face g(x) | Total area of of the cube h(x) |
|------------------------------|----------------------------|--------------------|--------------------------------|
|                              |                            |                    |                                |
|                              |                            |                    |                                |
|                              |                            |                    |                                |
|                              |                            |                    |                                |
|                              |                            |                    |                                |

Table 1

- 1.2. Considers the following functions:

$f(x)$  which associates the measure of the each cube x edge and the perimeter of a face;  
 $g(x)$  which associates the measure of the each cube x edge, the area of a face;  
 $h(x)$  which associates the measurement of each cube x edge, their total area.

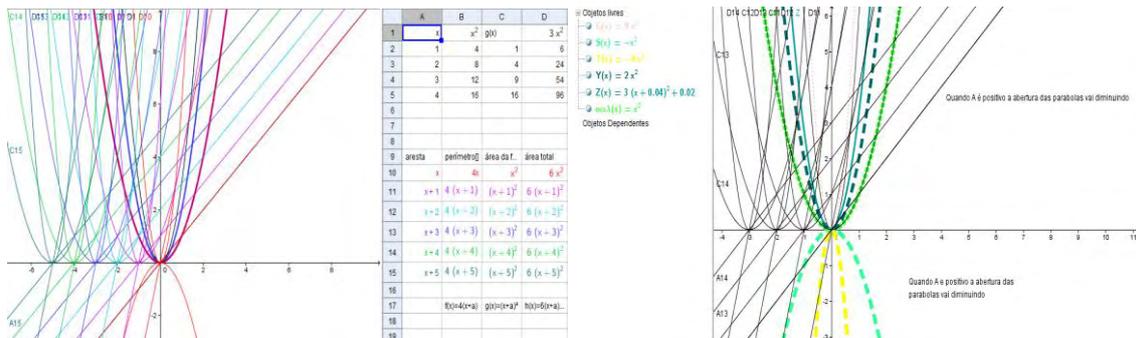
- 1.2.1. Explores by generalizing the results in table 1 and shows the algebraic functions f, g and h. **Justified your answers.**
- 1.2.2. Investigates the effect of the value of a, with N0 in the graphic representation of tasks of item 1.2. which are quadratic, with the help of Geogebra. **Justifies your answers.**

Table 4. Dimension fluency evaluation.

| Number of ítem of       | number of correct answers/(%) |
|-------------------------|-------------------------------|
| 1.1.                    | 22 (85)                       |
| 1.2.1                   | 20 (78)                       |
| 1.2.2.                  | 15 (58)                       |
| Total number of answers | 26 (100)                      |

In the following figures 2-3, are presented, for example, two representative answers of the participants P 2 and P 3 that were realized of in graphical sheet software of Geogebra. These two responses were chosen in an intentional way among the productions of the participants of the two classes in order to better illustrate the evaluation of fluency dimension in mathematical creativity.

Figure 2. Representative answer of the participant P 2. Figure 3. Representative answer of the participant P 3.



## 5. Conclusions

The results obtained highlight that the participants of this study associated the concept of mathematical creativity with the category of analysis "*Innovation*" which is in line with the investigation findings of (Leikin, 2009). In evaluation of mathematical creativity, the fluency was the only dimension evaluated in the answers of participants, being verified for greater representativeness in the item of exploratory nature than in the item of investigative nature. In regarding the integration of mathematical class of Geogebra, the participants answered affirmatively to their integration and liked to use it in the class. The main reasons for that were the permit one innovative learning and also the software skills. For contributions of the software in the understanding of the mathematical concepts explored, the participants responded to easy in learning and learned something new. However, in view of the small number of participants, it is not possible to generalize the results obtained. But stand out of as main contributions of this study, the development and sharing of teaching experiences using technology (Geogebra) in the promotion of mathematical creativity and the motivation in learning, verified by direct observation of the effort of the participants.

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## A METAPHOR FOR OUTDOOR TRAINING

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### Abstract

On the basis of experiential learning, outdoor training and metaphorical learning theories, this paper demonstrates theoretically and methodologically how fishery can become an effective experiential learning environment. "Being in the same boat", in this paper, is not just a metaphor but the learning setting. In this learning setting the group, under the trainer's careful monitoring/facilitation, has the opportunity to experience itself in a highly stimulating and participatory environment, gaining relational and communicative skills.

**Keywords:** *Experiential Learning, Outdoor Training, Metaphorical Learning, Adult education.*

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### 1. Introduction

Using experiential learning theories (Dewey, 1938), (Jaffrin, Griffin, Halford, 1998), outdoor training theories (Kolb, 1984) (Boud, Walker, 1999) and metaphoric learning (Berendt, 2008) we intend to theoretically demonstrate how fishing can become an effective experiential learning setting. "Being in the same boat" evokes a "WE" that is generated not by the words we use but by the living condition those words refer to; *Being in the same boat* is not just a metaphor but represents the learning setting where the group experiences itself in a deeply stimulant and shared context, giving to individuals and to the group the chance to understand relational and communicative potential.

The metaphoric experiential learning, regaining the ludic and recreational side of learning, "consists in playing activities, sportive and artistic expressions that direct the thoughts towards objectives apparently far away from working dynamics and afterwards derive process logics and content analogies" (Rago, 2006, p. 109-110).

The metaphor has to be wisely planned in order to complete this task and produce the needed analogies with the organizational environment, the rules, the atmosphere, the climate and the context organizational culture; moreover, it has to be continuously nurtured and supported by the chosen location.

As suggested by E. Rago, learning carried out by metaphorical activities:

- strengthens participants' *analogical reasoning*;
- facilitates the *expression of perceptions*, emotions and attitudes;
- generates a *social and contextual meaning* (i.e. "located");
- reaches the *tacit knowledge* and the implicit, the basic assumptions of organizational action;
- stimulates, in cognitive terms, *social creativity and imagination*, changing the perception and interpretation of the events;
- helps *the cognitive changing*; it is able to gather, elaborate, reinforce, explain and spread the existent knowledge.

The metaphor intentionally planned has to be able to evaluate and therefore to produce the right level of stress in the formative activities. When the level of stress is the right one it "produces appropriate stimuli, anticipation, excitement: all factors that help engaging people in participating to the activities (eustress)" (Rago, 2006, p. 140).

Briefly, we can say that the experiential metaphor planning must work to generate an imaginary risk: in order to *be in the same boat* and to make this metaphor a formative setting, engaging and effective, it will be beneficial to consider the perceived risk and the right level of involvement, leaving the comfort zone.

In this paper we synthetically describe the developed formative model, tested in a pilot phase in 2013. After this pilot test, we felt it was necessary to present the model principal characteristics and reach its subsequent modelling.

## 2. Design

The essential and constitutive elements that define the model can be summarized as follows: *the boat, the group, the trainer*.

*The boat*: seen as a learning environment, it gives a “Space” not completely defined, with a certain level of incertitude and uncontrollability, able to foster active participation in the learning process, directly involving students in the processes of gaining competences (soft skills). Thanks to the pedagogical intentionality the boat is imagined and planned as a learning setting. The learning setting is opportunely used by the trainer to plan and implement the formative activities.

*The group*: the group is fundamental in performing formative activities. Each part of the group has a defined role in the planning phase which is functional in the fishing activities.

*The Trainer*: *in primis* he is a facilitator of the learning processes in the group, a director of the conditions in which the individuals and the group implement the formative activity.

### 2.1. Didactic methodology (cooperative learning)

Didactic methodology for learning in a group: Cooperative learning (Kagan, 2000) (Johnson & Johnson, 2005). Cooperating means helping each other (peer learning) to understand the characteristics of a new concept with reference to the assigned task. Therefore, cooperating means having an internal model which effectively answers to other people’s feedback handling it and getting round it for having already experienced it. Moreover, cooperating means facilitating the explicit articulation of processes and concepts, acquiring more awareness and control on them and on the way knowledge has to be used (transfer and application) (Varisco, 2000, p. 22).

### 2.2. Activity

Epistemological criteria for activity planning:

- going from simple to complex
- increasing step by step the incertitude level of the result
- conveniently acting on corporeal and psycho-emotional mix
- focusing alternately on the group and the individual

Activity planning as in the pilot project:

- 1) Planning of reality tests by the trainers- facilitators
- 2) Assignment of reality tests to the group
- 3) Reality test task:
  - 3.1 Preliminary training for the sea trip (briefing)
  - 3.2 Sailing from the harbour
  - 3.3 Getting back the fishing nets (playing)
  - 3.4 Freeing the fish from the net
  - 3.5 Eviscerating the fish and putting it in proper boxes
  - 3.6 Arranging the fishing nets
- 4) Back to the harbour
- 5) Immediate reflections (debriefing)

Briefing – playing – debriefing (Rotondi, 2004)

- *briefing*: it is the moment when the activities which will take place are presented, objectives are revealed and right instructions for the task are given;

- *playing*: the moment of practical activities;

- *debriefing*: a moment for reflecting and capitalizing the lived experiences

## 3. Objectives

Main goal is to obtain an outdoor training model using the boat metaphor as a learning tool.

Thematic area: organizational learning – sub topic: team building in working contexts.

### 3.1. Pilot project

The pilot project has been tested with 52 students (5 groups) of P.O.N. projects at DHITECH Scarl – Distretto Tecnologico High Tech University of Salento.

The test results led to define this first proposal of formative model.

#### 4. Methods

The methodological steps in this pilot stage for designing the model are listed below. These methodological steps are subject to flexible contextualization with regards to the commissioner's specific requests. Nevertheless, these steps represent the basic passages for the model implementation..

- 1) Commissioner's analysis (focused interview with the Commissioner in order to understand the formative needs in the organizational context – commissioner's vision)
- 2) Analysis of the organizational documents (organizational model, previous training activities, etc.)
- 3) Draft of the training proposal (Version 1)
- 4) Target group educational activation: sensibilization and involvement in the formative project
- 5) Questionnaire on formative needs in the target group (employees' vision)
- 6) Negotiation of the proposal with the Commissioner (version 1) and definition of the final proposal of the training project (version 2)
- 7) training project delivery to the target group (version 2)
- 8) Formative activity
  - 8.1) entry profile of the target group (personality test, organizational metaphors, deep interview)
  - 8.2) sub group definition (from the data 8.1)
  - 8.3) Evaluation grids created by the trainers – in itinere evaluation (soft skills and team building indicators)
  - 8.4) Evaluation grids created by the trainers – final evaluation (soft skills and team building indicators)
  - 8.5) Group self evaluation charts (soft skills and team building indicators)
  - 8.6) Reflective setting on the topic emerging from the formative activity and from point 1-5-6-8
  - 8.7) Customer satisfaction questionnaire
- 9) Data analysis and final report draft
- 10) Final report delivery to the Commissioner and the target group

#### 5. Discussion

In this paper we demonstrate how the displayed experiential metaphor involves the training group at different levels:

- *Physical*: arranging the fishing nets, putting them on the boat, freeing the fish from the net;
- *emotional*: the proposed activities generate reactions which are determined by personal inputs (for example freeing a living fish from the net);
- *cognitive*: participants undoubtedly link practical and simulated reality (... "I never thought I could react that way" one of the participants says).

The deep immersion in the formative experience and the appropriate duration, as M. Rotondi reminds us, makes us loose the edge effect and therefore fosters empathy and its effects. By this "edge effect" we mean what happens when for example we watch the TV and, while the scenes pass on the screen, we also perceive the TV borders. This perception constantly reminds our brain – often silently- that those scenes are fiction and that we are outside (Rotondi, 2004, p. 69).

This effect when sailing is amplified by the nature of the stimuli the group is exposed to in an environment not really familiar. As soon as the *border* between the land and the *liquid land* is crossed, we become different, there is no more difference between reality and didactic activities. However, the trainer's pedagogical intentionality will be able to separate the two dimensions in order not to lose the direction and the formative responsibility of the entire initiative.

#### 6. Conclusion

Many points are still open to further discussions and will promote future investigations. Some of the methodological points can be summarized as follows:

- Evaluating the training effectiveness with regards to external factors which occur in the process;
- Defining what kind of tools can be used to evaluate the transferability of complex competences and the processes. These latter can be experimented in different ways by the different subjects and therefore self-evaluation plays a fundamental role in evaluating the learning transferability.

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## **THE USE OF ITC IN THE LEARNING PROCESS OF STUDENTS WITH CEREBRAL PALSY**

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### **Abstract**

We live in a society where technology is one of the most important elements. Anyone is fully integrated if they don't know how to use this instrument. It offers a great variety of possibilities to the students present in our classroom. Perhaps one of the least studied disabilities is cerebral palsy. There are a lot of computer applications that have not found their use in specific cases. Therefore the aim of our research was to analyse and reflect about the contribution of ICTs in the motor, cognitive and socio-affective structure of these students. Moreover it was analysed the improvement of these methods in front of classical methodologies. In order to obtain this goal we made an intervention proposal using ICB (Interactive Communication Board) that was applied to an eleven year-old student inside her learning environment. Using direct observation and serving us a registration desk we analysed the skills put in place by the students in the different methodologies (Using TIC and classical material). This intervention was produced during three months. Each session lasted one hour twice a week. The results indicated a higher degree of motivation, development of motor skills, independence and self-esteem in the interactive activities. It indicates the importance of the use of ICT in the learning process of students with special education needs.

**Keywords:** *ITC, Cerebral Palsy, Learning process, special need educations, disability*

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### **1. Introduction**

ICT has enabled great advances in our society and especially in the educational field. It is an important tool to respond to the diversity of our classroom. However, it is clear that there is a difficulty of accessibility that is particularly significant for people with little or no mobility. In the case of these students we are dealing with a handicap added, according to Seligman (1991), occurs when a person performs voluntary actions that do not bring results, and when these are not dependent on these successes in the question. Therefore, being able to control the environment directly with small movements through ICT represents a new way of learning and enabling environment for people with Cerebral Palsy. For Santamaría, González, Manso, Pérez, (2013) cerebral palsy, implies upsets permanent and progressive development that affects movement and posture and as a result, there are difficulties in learning and social relations. These authors explain that ICT has been a really functional tool for communication in favor of people with PCs, improving their quality of life around relationships and family, but also has been having difficulties in access to the equipment and regular Internet connections because "often requires the combination or interconnection of different services, tools and strategies that go beyond the ability of people with PC. Moreover, Sánchez-Asín (2004) concludes that ITC together with a series of technical aids enable students to obtain better results of their skills. These aspects can allow individualized, and customize the task producing better motivation.

### **2. Method**

The aim of this section is to analyze some aspects related with the methodology that we have used in this research. The first subsection studies some features about the participants, in addition to this we will know which criteria has been selected. The second subsection will continue with the instrument. After that it will be shown the design of the methodology. Finally this section will finish with the procedure. However, it is necessary to remember the aims of our study. They are summarized in the following points:

- Make a comparison between the skills, knowledge and attitudes acquired through ICT compared with same student but using conventional learning tools.
- Think about the type of resources would be interesting for students with cerebral palsy.
- Analyze the methods and resources carried out for students with cerebral palsy using ITC and apply in real classroom situations.
- To study the strengths of students with cerebral palsy

## 2.1. Participants

The proposal is made within a special education school under the supervision of the Therapeutic Education teacher tutor which also provided us with information about the student and his learning process. The student was 11 years old diagnosed with Cerebral Palsy which affects the mobility of the four limbs. She presented frequent involuntary movements to upper extremities. The student is able to communicate orally, despite the difficulty of his condition, and is also able to move his head and arms. It also had the ability to move with some autonomy through the electric wheelchair that does go through slight movements of the head. The fundamental educational objective pursued with this student work is personal autonomy in activities of daily living, use of community resources, acquisition and development of social skills and activities of the working life, with particular emphasis on speaking skills development.

## 2.2. Instrument

The aim of this section is to study which instrument has been used in our research. The first tool that has been worked was the Personal Computer (PC). It was located on a table with access for wheelchair and with adequate lighting, sound and visual material which could provide support. In addition to this TICO software was needed for people with severe motor problems. It can be worked with pictograms on interactive communication boards. According to this software it is emphasized the following features, moreover in figure 1 it is shown the different options of this tool.

- A section for the editor: This section allows you to create boards with pictures, sounds and control environment with pictograms
- Another section for the performer designed to overcome the limitations of using communication board. A route used by all sequential images. This can have two different objectives according to the needs of the student: the emission of messages or control environment.
- The List Project Boards, which is a type of connection options offered by the program board, and can choose the one that is considered most appropriate for each situation. There are boards designed to work language and other led to the organization of the environment.

Figure 1. TICO Software.



With the objective of a correct use of the previous materials, it was necessary to create a series of devices that allowed the student's access to ICT resources. Firstly, a device placed in the back of the head that allowed him to click making a backward movement with it. Secondly, by means of arm movements he could make movement of the cursor by the computer screen. For this, a bracelet connected to the device is used. This elements are observed in figure 2.

Figure 2. Another devices to access to ITC.



To conclude with this section the evaluation register used during the intervention is shown. It evaluates from 1 to 5 each one of the raised abilities. It can be shown in table I.

Table 1. Record of the results.

| Observation Guidelines                           | Skills obtained using ITC |   |   |   |   |
|--|---------------------------|---|---|---|---|
|  | 1                         | 2 | 3 | 4 | 5 |
| Know different vocabulary                        | 1                         | 2 | 3 | 4 | 5 |
| Understand the concepts of the task              | 1                         | 2 | 3 | 4 | 5 |
| Make coordinated movements                       | 1                         | 2 | 3 | 4 | 5 |
| Make precise movements.                          | 1                         | 2 | 3 | 4 | 5 |
| Reads and understands words and simple sentences | 1                         | 2 | 3 | 4 | 5 |
| Show ideas and needs.                            | 1                         | 2 | 3 | 4 | 5 |
| She includes guidelines given orally.            | 1                         | 2 | 3 | 4 | 5 |
| Show confidence in herself.                      | 1                         | 2 | 3 | 4 | 5 |
| She Is motivated to work.                        | 1                         | 2 | 3 | 4 | 5 |
| Socialize with mates                             | 1                         | 2 | 3 | 4 | 5 |

### 2.3. Design

The target of his section is to study which type of activities were designed using this instruments. The activities with ICT resources and program TICO consisted initially connect the device with computer access and the student responsible for this: choose the day, month and year and weather of that day. The images passed sequentially with the movements of his right hand. When he came out the appropriate option on the screen, press the device it from the back of his head with a movement backwards. This activity is performed once a week in a total of four sessions during the month of the study. In contrast task with traditional methodology were:

- Filling the agenda in which the student verbally express what had been filled and another person in charge of writing it. Among the items to be filled was his name, the date and the tasks they had to do that day. Filling the daily agenda was made at the beginning of the day.
- Discrimination tokens. In this type of activity the student was asked about the number of letter that it has been indicated.
- Artistic activities. The student brush painted clay figures and drawing paper under the table tilt. Such activities are carried out on average three times a week.

### 2.4. Procedure

The period of observation and analysis were 34 school days during twelve weeks, through direct interaction with the student and their normal learning environment. The intervention was organized using two sessions of 60 minutes with the students each week. Furthermore two other sessions were focused on analyse educational program and diverse documents. The structure of the meetings and activities were based on a participatory approach and active part of the student to be able to directly observe their skills. Moreover it was worked a functional methodology to obtain a good communication and develop in the different environments. The activities that took place during the intervention were classified into three types:

- Introduction Activities: At the beginning of the work the tutor told him in detail what the student had to do, showing them visually material.
- Development Activities: In this phase were developed educational activities designed using the TICO software.
- Closing activities: The session ends with reinforcements and congratulated the students.

During these three stages which consisted activity, observations were being recorded in the table previously exposed. Moreover the traditional activities proposed in the previous section were carried out once a week.

### 3. Results

Taking as a reference the table indicated in the previous section, it will be study which the benefits of applied ITC were with this students. In table 1 it is shown the most important skills acquired by the students using ITC versus traditional methods. The data were obtained by direct observation.

Table 2. Record the results of the skills acquired through ICT.

| Skills obtained using ITC                        | Percentages using ICT | Percentages using traditional methods |
|--|-----------------------|---------------------------------------|
| Know different vocabulary                        | 11,8                  | 10,3                                  |
| Understand the concepts of the task              | 11,8                  | 10,3                                  |
| Make coordinated movements                       | 11,8                  | 10,3                                  |
| Make precise movements.                          | 11,8                  | 7,01                                  |
| Reads and understands words and simple sentences | 14,7                  | 10,3                                  |
| Show ideas and needs.                            | 3,01                  | 10,3                                  |
| She includes guidelines given orally.            | 11,8                  | 14,0                                  |
| Show confidence in herself.                      | 8,82                  | 3,01                                  |
| She Is motivated to work.                        | 9,10                  | 6                                     |
| Socialize with mates                             | 5,01                  | 2,30                                  |

### 4. Discussions

As shown in the tables above, if there are differences include knowledge, skills, attitudes and levels of socialization acquired. With the use of ICT has been a greater knowledge of vocabulary and concepts related to the work (an 11.76%) compared to acquire via conventional methods (a 10.34%). In addition to this, there is greater coordination of ICT movements (11.76%) compared to using traditional methodologies (10.34%) and more precise movements with ICT (11, 76%) in comparison to other methods (7,01%). As for language skills, significant differences were detected, while the reading comprehension level ICT (14.70%), conventional methods (10.14%). Moreover, the attitudes of the student in terms of demonstrating confidence in itself are superior to work with the program and access devices TICO (8.82%) with manual resources (3.44%). To sum up the changes produced by ICT are a consequence of the great versatility. The students have a tool that allows to perform any of the basic tasks without help. As a result it is produced an advanced in the different areas of learning of this children. For example children are able to organize an agenda with their daily tasks and be able to communicate in various social situations

### 5. Conclusions

The objective of this section is to evaluate which the most important aspects of our study have been obtained. Therefore it will be summarize some of this features:

- She shows greater motivation when working with ICT tools
  - An improvement of the autonomy due to the devices of adaptation of access to the TIC.
- In addition to this, there was an improvement in her self-esteem.
- Improved coordination and accuracy of movements due to the need to use ICT access devices
  - She suffers an improvements in skills of reading due to movement, bright pictures and stimulated environments.
  - The student experiences a change in written comprehension since ICT resources make it necessary for the student to make the effort to read the words that appear on the screen. In this situation the student will have to choose the most appropriate word depending on the position.

As it is seen, the contribution of ICT to the learning of students with Cerebral Palsy are quantitatively better than the conventional methods. It opens new doors to acquiring new skills that have traditionally been very important for students as a result of their limited mobility. For these reasons it is considered the need to build a bridge between the two learning methods worked in a coordinated and complementary, although with particular relevance to the use of ICT to meet the need of autonomy, so that archive needs required for people with Cerebral Palsy.

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## UBIQUITOUS INDIGENOUS AFRICAN LIFELONG EDUCATION AS “NEW” FOUNDATIONS FOR SUSTAINABLE HUMAN DEVELOPMENT

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### Abstract

The call for alternative approaches and to education in the age of globalization has come from many fronts including from outside education. The call has especially been accentuated by the fact that most researchers and authors have affirmed growing inequity across the globe and the widening of the poor-rich gap. Most have queried the role of education in addressing the slanted “development” in spite of the resources committed to education. Part of the conclusion from most analysis is the fact that education has not hitherto truly been serving the cause of the “common good” of humanity. UNESCO has, in a 2015 book entitle *Rethinking education*, argued for an almost root and branch re-setting of education. Their argument builds on the premise that education is still the most viable source of building sustainable human and social development. However, the most compelling argument in the face of the irresistible diversity of the global community is the need for education to look beyond the status quo and often Eurocentric frameworks of education.

This paper presents indigenous African lifelong education as one of the many new approaches that complement and enhance the push towards a universal and humanistic approach to education for sustainable human and social developments. It combines theorizing from literature with the authors’ empirical and existential connections to indigenous African education to offer an alternative approach. It summarizes the comprehensive, critical, eclectic, humanist, womb-to-tomb (lifelong), and ubiquitous nature of indigenous epistemology. The paper concludes by presenting African indigenous lifelong learning as one of the “new” and necessary foundations for education that serves the common good of humanity.

**Keywords:** *African, indigenous, lifelong-learning, teaching.*

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### 1. Linear and Holistic Foundations

It is important to begin with some clarification of the title of this presentation. It is especially important to clarify why “new” is in quotation marks. Indigenous education in traditional Africa, as well as among indigenous peoples across the globe; lifelong learning has always been synonymous with life and living (Avoseh, 2011). For such people indigenous education has always been a framework and foundation for life and living. This foundation dates back to the ancestors and therefore cannot be called new. However, and within the lexicon of Western education, ideas from indigenous lifelong education from any part of the globe is treated as “new.”

The realities of globalization have compelled education, educators, and scholars to find “new” ways and ideas that will complement those areas of Western education that do not seem to have the capacity to handle the challenges of education in a global sense. Merriam (2010) correctly identified two powerful trends that globalization has promoted in respect of adult education and they are significant to this short paper. The trends are “the infusion of non-Western perspectives into our thinking about learning and the emergence of lifelong learning as a unifying concept for (our) practice” (p. 404). Merriam’s reference to non-Western perspectives is better put as indigenous perspectives because negating the term “Western” as a way of acknowledging indigenous values is not quite complimentary to indigenous peoples in spite of the esteemed educator’s good intentions.

Quite often, any reference to indigenous education is by implication reference to its womb to tomb education that is ever present in every sector of a community’s life. This explains our use of the concept ubiquitous to describe indigenous lifelong learning because it was present everywhere and anywhere there is human/spiritual activity in the community. The complex and blended nature of

indigenous African education do not in any way make its objective, content, and process haphazard (Avoseh, Fayomi, & Simeon-Fayomi, 2013). Rather than being haphazard, indigenous education uses its holistic nature and format to connect every facet of life and living in the community including the spiritual arm of the community. This holistic nature compels it to be a humanistic process and makes everyone an educator as well as a student at some point; this is similar to what Freire (2004) refers to as a situation of educator/educatee and educatee/educator. This holistic foundation is what is “new” within the present dispensation of education in a globalized world and it provides foundational frames that support the Western foundations. However, it is often a difficult task to present the indigenous framework to those whose lives and education have been strictly within the Western framework. It is also often difficult to get to understand, no matter how clear the explanation might be from the other side. This is the linear/holistic problem.

The linear mind sees and understands in linear ways. The indigenous mind sees in holistic and circular ways. Amadi (as cited in Ehusani, 1992) uses the reality structure of both mindsets to draw a clearer distinction between the two. He argues that the African reality structure is depicted by the harmony between humanity and nature and it means “inclusiveness, interdependence, and totality” (p. 109). The Western reality structure is characterized by conflict between humanity and nature and this implies “the mechanism of antagonism, conflict, aggression, and competition” (p. 109). It compares indigenous thought with Western thought and uses the linear rubric of the West to “judge” ideas from indigenous societies including those of traditional Africa, as being unscientific. Being scientific means conforming to the Western thought pattern and being non-scientific implies irrational and often superstitious thought. For instance, belief in ancestors and its implications would qualify as superstition and none academic while some Western statistical calculations would represent academic and intellectual rigor. Thus for the most part, indigenous knowledge is considered mostly superstitious while scientific, rational thought is pure, Western. Wiredu (1997) has argued that using the Western to determine the value and impact of traditional African thought runs against logic noting that no people have a monopoly of rational knowledge just as superstition is not the preserve of any group of people. He contends that “rational knowledge is not the preserve of the modern West, nor is superstition a peculiarity of the African peoples” (p. 322). The linear/holistic difference is often manifesting in reviews of academic work because the Western rubric is what most reviewers know and use. Consequently, two reviewers (one that is 100% linear and the other that has some idea of non-Western perspectives) are often likely to review the same with scores and comments that are contrary.

Our proposal for this conference was evaluated by two reviewers.

The evaluation results provided to us from the two reviewers are as follows and they are listed without any edits:

First reviewer’s Comments: “The proposal is very interesting and the abstract is well structured.”

Positive Points: “Significance and originality. Clear and focused presentation.”

Comments: “The topic of the research is significant in the context of lifelong learning. Methods of data gathering and analysis are not presented in the summary. It is recommended (sic) to involve results and conclusion (sic) of the research, show new aspects of lifelong learning.”

Negative Points: “Methods of data gathering and analysis are not presented in the summary. It is recommended (sic) to involve results and conclusion (sic) of the research, show new aspects of lifelong learning.” The scores are as follows:

Originality: 5 - Average

Significance: 5 - Average

Technical: 5 - Average

Relevance: 6 - Good

Classification: 5 - Average

The second reviewer’s score and short comments for the same proposal are as follows:

Originality: 7 - Excellent

Significance: 7 - Excellent

Technical: 6 - Good

Relevance: 7 - Excellent

Classification: 7 - Excellent

Comments: The proposal is very interesting and the abstract is well structured.

Positive Points: Significance and originality. Clear and focused presentation.

The first review’s comments above are a reflection of a typical linear mind. There is reference to “Methods of data gathering and analysis are not presented in the summary. It is recommended (sic) to involve results and conclusion (sic) of the research...” This reviewer has done an excellent job using the linear rubric. This rubric is based on the analytic character of Western thought pattern and culture. The first reviewer has used this very well in the assessment of this proposal. The proposal is caught up in one

of the problems that Smith (2012) identified with academic writing. According to the author “academic writing is a form of selecting, arranging and presenting knowledge. It privileges sets of texts, views about the history of an idea, what issues count as significant...” (p. 37). Consequently, the reviewer has done exactly what is expected of a competent reviewer. The problem however arises from the fact that the proposal derives from the African holistic and intuitive mind and culture. Hence a very good rubric (from the Center) was being applied to sets of values from the periphery that it is not designed to measure. The analytic Western process separates the knower from the known, it does not “separate religion, politics, economics, education...into independent or autonomous processes or experiences” (Anyanwu 1983, p. 43).

Whereas the indigenous method acknowledges existential importance as an important data “gathering” and “analysis”; the linear mind does not see it as such. The reference to research implies a heavy accent on the linear rubric that must see those elements in a step by step pattern for anything to qualify as research. We are of the view that presenting works as ours is a way of “educating” the linear mind and providing opportunity for the circular indigenous rubric to be seen as valid for the indigenous lifelong learning and ways of knowing. However, and in spite of the difference between the linear and the holistic, there is more benefit in the difference for the new challenges confronting education within the exigencies of globalization. The difference creates opportunity for diversity in the process of knowledge creation and utilization. Whereas the Western linear foundation provides the basis for analytical science and technological advancements; the holistic indigenous African framework offers the much needed complement of the linear through its deeply humanistic approach. UNESCO (2015) has underlined the humanistic approach as the missing frame in the drive to make education a common good. According to UNESCO “A humanistic perspective is a necessary basis of alternative approaches to education and human well-being” (2015, p. 33).

## 2. Indigenous Lifelong Learning As a “New” Foundation

Indigenous lifelong learning stands out in its being grounded in corporate existence which emphasizes the humanistic dimensions of life. Education and life in the traditional African setting has always been about self in relation to others – including the ancestors and babies in the womb. The essence of the womb-to-tomb indigenous lifelong learning is to humanize the community at every opportunity. We are aware that the humanistic perspective is not a prerogative of indigenous lifelong learning. Several educators and scholars especially from the liberal bracket had emphasized humanistic education. In fact philosophers of the Existentialist tradition, including Søren Kierkegaard and Fredrick Nietzsche are credited with providing the philosophical roots with their emphasis on the individual, freedom, and choice. The humanistic emphasis has however been more pronounced in adult and continuing education with the works of Julius Nyerere (1974), Malcolm Knowles (1978), and Eduard Lindeman (1961). There is however a marked difference between humanism as expressed by these educators and those of indigenous lifelong learning. Whereas these educators’ positions were reactions to the challenges of the educational system of their times and context, humanism is not a reaction in indigenous education but it is indigenous education itself. We present a brief overview of indigenous lifelong learning in the next couple of paragraphs.

Indigenous lifelong learning dates back to the first peoples (ancestors) whose way of life and accomplishments were guided by the values of the community. It is therefore not surprising that they (ancestors) still hold the copyright of knowledge in indigenous societies and especially in traditional Africa. The ancestors uttered the first words on Earth; hence obeisance is paid to them every time proverbs (a critical aspect of indigenous education) are used. Proverbs are very important aspects of indigenous education because the process pivots on *orature/orality* (the power of the spoken word). Avoseh (2012) elaborates on the importance of orature as the glue that holds most of the unwritten nature of indigenous lifelong learning. He further explained the complexity of the foundation of indigenous lifelong learning. According to him, “the seamless nature of the content of traditional African education makes its foundation a combination of the abstract, the philosophical, the moral, historical, the sociological, as well as the theological” (Avoseh, 2012, p. 242). This complex foundation is influenced by the aims and objectives of indigenous African education.

The aims and objectives of indigenous lifelong learning have a universal outlook in spite of the intimidating diversity of communities and peoples of Africa. Ansu Datta (as cited in Avoseh et.al (2013) provides three main aims of indigenous African education. These include preserving cultural heritage, educating new generations on the importance of the environment, and to educate them on the need to perpetuate all that were inherited from the ancestors – institutions, values and laws. Indigenous lifelong learning has many objectives but six objectives stand out and they serve as umbrella for all other

sub-objectives. These six umbrella objectives are laid out by Fafunwa (as cited in Avoseh et. al, 2013). These objectives include:

- To develop the child's latent physical skills
- To develop character
- To inculcate respect for elders and those in position of authority
- To develop intellectual skills
- To acquire specific vocational training and to develop a healthy attitude towards honest labor
- To understand, appreciate and promote the cultural heritage of the community at large (p. 23).

These objectives stretch indigenous lifelong education from early childhood education through advanced adult education up to "continuing education" from the metaphysical world of the ancestors. The moderate proportion of this paper does not allow us the space to go into detail on the process of indigenous lifelong learning. Suffice to say that every aspect of a community's life is educational and there is education in everything. Hence indigenous education is ubiquitous, free, and compulsory to a large extent because anyone who refuses to learn is referred by the Yoruba as *òkú èniyàn* (the living dead). The outcome of indigenous education in all aspects and in every community is measured by the objective developing character. Developing character is synonymous with active citizenship. The quality and quantity of one's education is measured by the extent to which one puts it to use for the good of the community through demonstration of character and commitment to corporate existence.

The active citizen pursues and acquires knowledge within the community through interaction with all facets of the community's life including the totality of the environment. In addition to intellectual pursuit, active citizens must have vocations through which to fend for family and kin. Even in the area of vocational education and training, the emphasis on the individual within the group is high. One such area is entrepreneurship. Entrepreneurship combines the best of liberal lifelong learning and functions on the Yoruba dictum of *àsowọpọ* (joining hands) and it forms the basis for *Egbe àlasọwọpọ* (cooperative society). Although such cooperative societies have some monetary aspect – *Èsúsú* (credit union), cooperative societies were mostly labor related and were determined by the needs of members. It was based on the principle of collective labor for efficiency and higher productivity. Groups of individuals form such societies that allow members to draw on collective and free labor by inviting the group to work on a project that requires intensive labor. Such use of labor could be in a farm, to build a house, to complete a quick business set up etc. The use of the group is rotated until everyone has taken a turn unless a member passes a turn. This form of *àsowọpọ* is called *Ọwẹ* and *àáró* (the group could be used on special request and the group is used turns by members). These societies cut across genders and were very effective in encouraging honest labor and, most importantly, cultivating and sustaining entrepreneurship. Daramolá *ati* Jeje (1975, pp. 110-120) provide details of *Egbe àlasọwọpọ* among the Yoruba. The example of vocational education and entrepreneurship presented above is representative of the focus of the rest of indigenous lifelong learning; the individual in a group - humanity.

### 3. Conclusion

Central to the new developments in human history is globalization and its spate of rapid changes and complex diversity. There is no doubt globalization has brought positive changes to the human community but it has also brought challenges that portend great danger to humanity. Education is always at the forefront of finding solutions to society's problems hence the calls to re-jig education to cope with the challenges of globalization. UNESCO is a leading voice on this call and it places its emphasis on energizing the humanistic powers of education. Indigenous knowledge systems and especially indigenous African lifelong learning are couched in humanism with an intricate connection to the ancestral and natural world. They provide alternative "new" foundations for the type of education required for meaningful development and existence. Of course the indigenous education systems need certain forms and shapes to make them accessible to the outsider. It is in this respect that we align with UNESCO's (2015) call that "alternative knowledge systems need to be recognized and properly accounted for, rather than relegated to an inferior status" (p. 30). One viable alternative knowledge system is indigenous African education that provides the best of humanistic educational process through its dictum of living as learning and learning as living in a community. This is what this paper offers as one of the "new" foundations for sustainable human development.

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# THE USE OF THE INTERACTIVE DIGITAL WHITEBOARD IN STUDENTS WITH ATTENTION DEFICIT DISORDER AND HYPERACTIVITY: INTERVENTION PROPOSAL

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## Abstract

We live in a society where different types of technologies exist. Everybody has their own mobile phone, tablet or other technological elements. This types of instrument are beginning to be used in our classes. In fact if we visit some of them, we will be able to see how children use it from very young. One of the elements that has evolved most is the blackboard. Now they are interactive and digital and allow the students to created new learning environments. Hence the diversity of our class, the main objective of our research is the development of an educational initiative focused on the interactive digital whiteboard in students with Attention Deficit Disorder and Hyperactivity. Moreover we want to improve attention and the impulsiveness of this students. We applied our activity to one student who is studying 3rd Primary at ordinary public school. This student was nine years-old and thus the proposal was adapted to this level. The results have shown that we can enhance the learning of students in attention deficit, using new technologies such as interactive digital whiteboards, which nowadays can be found in almost all schools and all classrooms.

*Keywords: ADDH, ITC, Intervention, hyperactivity, disorders.*

## 1. Introduction

Nowadays, Education is one of the most important element to show the progress in our society. It is necessary that knowledge arrives to everybody including people with disability. The access to this population has been possible due to the work of the TIC. These tools have responded to the needs of these students. It allows to adapt to the different types of learning. The aim of this research is the realization of an educational intervention using digital interactive whiteboard for students with Attention Deficit Disorder and Hyperactivity. In the same way, Marques (1997) technology has the following benefits for students with special needs.

- Enables a better adaptation to the characteristics, attitudes and skills of users, as well as the features of the content

- It enables the interconnection of information of various kinds and nature.

- Develop the application of new learning strategies not based on superficial learning.

Facilitates dynamic classroom because it can be shared by more than one student.

In addition to this, for author like Marques (2008) talk about some important benefits of IWB used in classroom. It is shown some of the most important aspects:

- Facilitates the teaching-learning process.

- It is an interaction between teacher and student that does not allow the traditional blackboard.

- It allows the manipulation of digital objects.

- It involves more students in tasks.

- It produces greater understanding of the contents due to a more graphic and visual access to them.

Furthermore for authors like Fernández Aedo (2013) the interactive whiteboard (IWB) has numerous benefits for students, among them an increase in motivation and interest due to the possibility of enjoying classes with a lot of resources. Moreover it allows collaborative work, discussions and colorful presentations. This types of aspects produces an improvement in sel-confidence and develop social skills.

To finish this section it is necessary to explain which AHDD is. According to APA (2013) ADHD is a neurodevelopmental disorder defined by problematic levels of inattention, disorganization and/or hyperactivity-impulsivity. The first of features involve the inability to continue working which seems not to listen. Therefor they lose materials at levels that are incompatible with the age of levels of development. Moreover, hyperactivity-impulsivity involves excessive activity, nervous movements, and inability to sit, interference in the activities of others. Furthermore according to APA (2013) they are unable to wait for the excessive age or level of development. ADHD often persists to adulthood, with consequent deterioration of social functioning, academic and occupational

From the point of view of its development Alegre de la Rosa (2000) identifies some strengths of this type of students.

- The children with ADHD usually have positive responses to social interaction.
- They tend to perform well in collaborative work activities.
- They like learning activities, where they obtain them success. They don't like activities relationship with writing, reading and calculation.
- They are happy if we remain at their side in performing some tasks difficult for him or her.
- They feel good using reinforced much praise and awards for achievements.

## 2. Method

The aim of this section is to study some aspects related with the methodology that we have used in this research. The first subsection study some features about the participants. The second subsection will focus on the instrument. After that it will be shown the design of the methodology. At the end of the section it will be explain the procedure. However, it is necessary to remember the aims of our study. They are summarized in the following points:

- Evaluate applications and the influence of the use of the whiteboard in learning.
- Make a didactic proposal for the case of Attention Deficit Disorder and Hyperactivity using whiteboard.
- Analyze the benefits of whiteboard in the case of ADHD.

### 2.1. Participants

The participant in our study is a nine year old child who is studying in an ordinary primary School. When the child attended class at age 3, it was observed that he had a bad behavior because he did not accept the rules. One year later he was diagnosed with a delay in maturation. After that in second year of primary school, he is diagnosed with learning difficulties. In a second diagnosis it is observed that the child presents ADHD. Now it will be summarize some features of this student:

- Level reading letters, syllables, words in a text below the expected.
- Reading comprehension low average
- Attentional difficulties for not passing the test of syntax
- The selective attention is impaired.
- The divided attention is impaired.
- The sustained attention is impaired.
- Cognitive style tends to impulsivity.

### 2.2. Instrument

The aim of this section is to study which instrument has been used in our research. To evaluate the knowledge of the child in this issue it was prepared a table to take notes about the behavior of the children (Table 1), in the other table it was compared the performance of children in regard to the level of his class (Table 2). Each number in the table represent one student. Both of table was used direct observation as a methodology. Furthermore, in both of them there are 27 items but are considered to show in the presentation two by dimension.

Table 1. Evaluation table of Topic about machines.

| Evaluation criteria for conceptual objectives    | Acquired | In process | Not achieved |
|--|----------|------------|--------------|
| It links theory to reality.                      |          |            |              |
| Defines the concept of machine                   |          |            |              |
| Defines the wheel and its usefulness             |          |            |              |
| Criteria for evaluation of procedural objectives |          |            |              |
| Use the whiteboard.                              |          |            |              |
| Keep reading.                                    |          |            |              |
| Express ideas.                                   |          |            |              |
| Attitudinal evaluation criteria                  |          |            |              |
| It is motivated ahead of learning                |          |            |              |
| Respect the ideas of others                      |          |            |              |

Table 2. Rubric direct observation the class group.

| Evaluation criteria for conceptual objectives    | 1 | 2 | 3 |
|--|---|---|---|
| It links theory to reality.                      |   |   |   |
| Defines the concept of machine                   |   |   |   |
| Defines the wheel and its usefulness             |   |   |   |
| Criteria for evaluation of procedural objectives |   |   |   |
| Use the whiteboard.                              |   |   |   |
| Keep reading.                                    |   |   |   |
| Express ideas.                                   |   |   |   |
| Attitudinal evaluation criteria                  |   |   |   |
| It is motivated ahead of learning                |   |   |   |
| Respect the ideas of others                      |   |   |   |

### 2.3. Design

In this section are shown which type of activities were designed to be applied in our research. . An adapted didactic unit was proposed whose subject of work was the machines. According to the established in the curriculum the objectives of these activities will be the analysis of mechanical operators (brake, lever, inclined plane) and their usefulness in the construction of a machine. The methodology used was inclusive, participatory where all children interactive with learning and learning from peers. Two models of activities performed by students are shown.

- Activity 1: It is projected on the interactive whiteboard different types of machines. The students have to respond this questions: What are they? What are they serving? What do they know about them? What types of machines have they got at home?

- Activity 2: Show on the whiteboard machines with wheels and ask students: What do these machines have in common? Which is the aim of the wheel? Do you know more machines using the wheel? Which is?

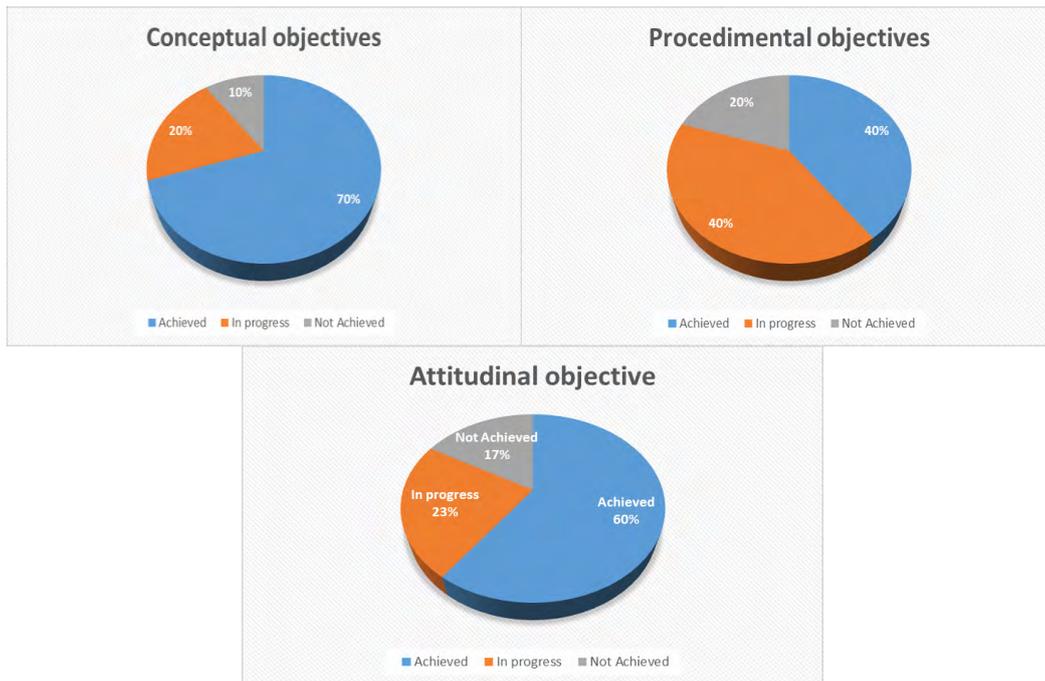
### 2.4. Procedure.

The intervention took place in the ordinary classroom and was carried out for 4 months. Independent of traditional methods, twice a week classes were designed to perform activity with the digital board as indicated in the previous section. The ordinary class with the AHDD student was composed of 25 children. In the center of the class tables are reserved for those students who are more easily distracted. In our case the student with ADHD is sitting at an individual table in the first row next to the teacher's table. In each of the activities proposed, we always seek the most active participation of the child.

### 3. Results

In this section are presented the results obtains of the different evaluation systems using direct observation. Later in the conclusions will be verified if the proposed objectives are met and also the didactic proposal is effective. Figure 1 shows the percentages the child has covered according to the different types of objectives set out in the didactic unit.

Figure 1. Percentage of objectives achieved.



#### 4. Discussions

The aim of this section is to analyse the results presented previously. In the graphs above it can be seen how the child has a large percentage of conceptual and attitudinal objectives. In contrast the number of procedimental objects is lower. Maybe it should be proposed more manipulative activities to improve the achievement of these goals. The use of new technologies may allow the acquisition of a more mechanical form of all procedural objectives. In addition, it has been seen how a new methodology, has increased the average grade in the class, so we can say that not only improves student performance on attention deficit disorder and hyperactivity, but also promotes the learning of all children in the classroom.

#### 5. Conclusions

The objective of this section is to evaluate which the most important aspects of our study have been obtained. Therefore it will be summarize some of this features:

- It have been improved selective attention to the children. He has been able to focus attention on the most important aspects of the session.
- Regarding to the learning process, as a result of the improved attention it was easier to remember and know that which have been seen in the explanation.
- In the same way it have been reduced his impulsivity. Therefore it was easier to control himself and stop breaking material.
- He has increased his self-esteem and self-concept. Moreover, he has been qualified to do the same as their peers, obtaining good results.
- Motivation with ICTs generate good results in student learning

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# MAKING A CASE FOR A STUDENT CENTRIC LEARNING MODEL

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## Abstract

In this paper we propose the Whole Person Learning Model which is comprised of seven components, which include (1) assessing and customizing a student's learning and thinking styles; (2) incorporation of the Whole Brain Teaching Model; (3) individual student coaching; (4) effective use of technology in a curriculum; (5) learning motivation; (6) Psychological Capital; and (7) establishing a standard for assessing or adapting a teacher's pedagogical style. This model gives students the ability to take more ownership of their own education and encouraging them to become more motivated in this new educational age.

**Keywords:** *Whole person, student centric, education, online, whole brain.*

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## 1. Introduction

In the modern economic environment, many people view education as their most viable path to making sustainable changes to their family's socioeconomic status. While students' motivation can be impacted by their ability to achieve desired results, education can also be used as a mechanism to help students develop their potential as mature adults who learn, thereby answering current needs expressed by employers. Unfortunately, current education systems are based on sequential and fact-based learning. Employers and the economic landscape call for participants who have creative and critical thinking abilities. Higher education of all types should serve as an avenue to self-improvement and economic stability. This being the case, why is it that less than 60% of students enrolled in an undergraduate program earn a four-year degree (Statistics, 2014). Higher education administrators are tasked with finding ways to educate both traditional and non-traditional students who have various learning and thinking styles, motivations, and knowledge of self and how to deal with life challenges as well as different access and approaches to technology.

This failure to adapt instruction methods consequently deters cognitive development, as it is more difficult today to attain a student's attention. The purpose of this paper is to present a Whole Person Learning Model (WPLM), that builds on Herrmann (2006) Whole Brain Model and links with thinking, learning, individual self-efficacy, self-esteem, intrinsic motivators, and life coping survival strategies as well as explores how technology can be used to interweave approaches to all of the above.

## 2. Problem Statement

Educational institutions need to enhance overall educational quality for asynchronous learners by constantly improving policies and procedures to produce a level of high quality learning for students while controlling cost. However, most institutions do not address the five key elements needed for today's student success. These are student cognitive ability, individual self-efficacy, self-esteem, intrinsic motivators, and life coping survival strategies. Nor do they appropriately address the interconnectivity of technology with these key elements. Success in these areas allows students to (a) become confident in themselves and their learning ability, (b) prepares them with the skills needed for employment, and (c) allows educational institutions to operate more efficiently as education quality improves.

## 3. Hypothesis

If we can build a whole person teaching model for e-learning environments, which includes the various elements to follow, we can impact a student's academic performance more effectively in an online learning environment while also improving the instructor to student relationship. Elements to be included

are: (a) identification of the student's learning and thinking styles; (b) the use of Hermann's Whole Brain Teaching Model; (c) creation of a model for students' individual coaching which helps the student connect with intrinsic motivators, (d) factors unique for the student's success. This model will combine who the student is and how the student learns best, the student's whole person model of self-awareness, with an instructor's pedagogical style and technological knowledge.

#### **4. The Framework to Revolution Education**

The authors of this paper propose a Whole Person Learning Model that can adapt to any teacher and student in an asynchronous learning environment, where the teacher to student relationship is effective in positively impacting a student's academic performance. This model comprises a six-step process to address the Fundamental E-learning Components (FEC). The FEC are essential to defining a next-generation classroom environment that delivers learning focused directly on a student's cognitive ability, interest, and motivational influences.

##### **4.1. Incorporating and Evolving Educational Technology**

Technology is the music setting the tempo, the beat, the timbre, and the compelling melodies. The pedagogy defines the choreography and directs the dancers' sweeping motions. The harmonious combination of technology and pedagogy help reveal and develop a student's creativity and responsiveness and allows him or her to learn effectively and enjoyably (Anderson & Dron, 2012). The traditional teaching methods of the past can no longer satisfy the new learning needs of the present. Today's models must emphasize speedy and effective acquisition and mastering of new knowledge (Hung, 2002).

Perhaps the best way to think about how social media can be integrated into e-learning is as a platform for a virtual community of practice, something along the lines of the technology developed by Dougiamas (2001), which encourages learners to investigate, exchange information, and promote ideas with like-minded people. The use of social media should be made more practical in terms of connecting students with industry experts, with peers of other cultures, and to academic professionals with the ability to challenge student learning.

According to the National Education Association ("Technology in Schools: The Ongoing Challenge of Access, Adequacy and Equity," 2008), schools have invested heavily in the infrastructure required to accommodate computers and the internet. It is important for students to learn new skills and improve their self-learning strategies as technology rapidly changes or is introduced into their environments (Perry, Phillips, & Hutchinson, 2006).

**4.1.1. Whole Brain Teaching and The Standard Educator's pedagogical style.** Whole Brain Teaching (WBT) is a learning model developed by Chris Biffle. According to Biffle (2012), there is something dreadfully wrong with the lecture model. Students listen, maybe they take notes, but soon, they glaze over, zone out, are lost inside private worlds. It increases teacher confidence because it allows for more creativity of instruction and affords greater student engagement in a reciprocal loop (Szott & Molitoris, 2010).

Pedagogical innovation demands a space that enables exploration by both teacher and student. To be effective, this space should allow for multiple modes of instruction and learning (Neill & Etheridge, 2008). Pedagogy incorporates six measurements of good teaching including practice, context, teachers' role, students' role, atmosphere, and environment. This inevitably leads to less dependence on traditional education unless it evolves with them.

**4.1.2. Student Mental Agility, Learning Styles, and Affective Status.** A student's mental agility refers to their ability to be receptive to different learning styles, the ability to cope with his or her own affective (emotional) status while learning, and a measurement of their psychological capital. These aspects of the student are at the root of a student's learning ability and should always be taken into consideration when addressing the educational needs of a student. Learning styles, affective status, and psychological capital contribute to greater understanding of the student's mental agility and the creation of programs that will be most meaningful for them.

This model focuses on the four types of learning styles as well as the student's affective status. The four learning styles used are visual, auditory, tactile, or a hybrid of the first three. E-learning systems and instructors must make a conscious effort to address a student's affective state by providing the "personal touch" a student would receive in a face-to-face learning environment (Morton & Qu, 2015).

As a standardized method to gauge an instructor's ability to educate students, psychological capital (PsyCap) can be used to determine where a student needs to improve to be considered effective in

mastering his/her studies. PsyCap can be defined as an individual's positive psychological state of development. This is characterized by: (1) having confidence, (2) making a positive attribution (optimism), (3) persevering toward goals, and when necessary, redirecting paths to goals (hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (resiliency) to attain success (Luthans, Youssef, & Avolio, 2006).

## 4.2. The Six Step Model

The WPLM model consists of six core steps, creating the foundation to a learning paradigm that can be implemented across many domains. The steps are 1) conduct an assessment; 2) create a student profile; 3) identify the student's learning style, strengths, and weaknesses; 4) adjust – add or remove content and material from – the curriculum; 5) learning phase; and 6) student content mastery. As a means of accurately measuring and comparing students that are on different academic levels, we have defined a “Student Learning Capability Index (SLCI)” to be used for assessment rather than traditional grade averages or standardized tests. A student learning capability index is a measurement of a student's mental agility.

**4.2.1. Step One: Conduct an Assessment.** To gain knowledge about a student's SLCI, an initial assessment must be given to use as a baseline. It is important to continuously assess a student's SLCI as it will change over time. This is due to the student becoming more aware of their learning and thinking style, he or she becomes more confident with incorporating other styles of learning, and he or she becomes more adept at balancing his or her abilities. The assessment will gauge and retrieve information about a student's mental agility by comparing the student's learning style, affective status, psychological capital, and academic history. The SLCI can be computed using the formula:

$$SLCI = (((l + a + p) / 3) * (g / 100)).$$

In this equation, *l* is the learning style index, *a* is the affective status index, *p* is the psychological capital index, and *g* is the student's academic history average. This assessment will be the benchmark to be used at the end of the cycle to determine the student's progress and help identify areas requiring additional attention.

**4.2.2. Step Two: Create a Student Profile.** It is essential to create a student profile to be shared with the learner. This aids the instructor in knowing how to educate a student in terms of most effective learning style and personal needs. A student profile should include information about a student's academic history, as is traditionally available. However, it will also include information about the student's mental agility. In all cases, this should be quantifiable data gathered from an official assessment. The data is not intended to be kept secret from the student. Rather, it should be used to help the student understand their own learning processes better as well as how to work with their natural talents to achieve more desirable results.

**4.2.3. Step Three: Identify the Student.** This is the most imperative step within this model, placing the student in the correct cohort to provide them the instruction most accessible to them. Based on the student's profile, it is important for an instructor or e-learning environment to properly identify the student's strengths and weaknesses. Furthermore, this builds additional comradely between the student and instructor, as the student comes to understand the instructor has their personal learning styles in mind while the instructor gains confidence that the student is receiving the lessons. This further builds a student's confidence to learn and an instructor's confidence to teach.

**4.2.4. Step Four: Adjust.** After an instructor has identified the student's SLCI, adjustments to the curriculum should be made to accommodate that student's mental agility. This could include providing visual content to support visual learners and/or audio content to address auditory learners. The identity of the student based on his or her profile can be denoted using categories. Using categories allows easy course management and distribution of content to students. This also allows instructors to target a specific group of learners with different feedback if needed. Furthermore, the use of categories gives instructors with the best fit pedagogic style the capability to instruct more effectively and efficiently. This can be achieved in an e-learning environment by adding more instructors or instructor aids to an online course to target one specific category of learners.

Currently, online instructors are overwhelmed in large online classes, as it is difficult to instruct each student personally based on their SLCI. This is because in an e-learning environment, it is more difficult to build a personal relationship without the synchronous face to face interaction of a traditional classroom structure. It is easier to target and address a group of students with a specific learning style in a synchronous learning environment than it is in an asynchronous learning environment. The structure of an

online course within our model should be geared to accommodate all types of learners in which they can receive effective feedback from an instructor that has the pedagogic style most suited to the student group's learning style. This approach of adding more students to a course, placing each student in the proper category, and assigning an instructor aid with the suitable pedagogic style to a category/group of similar students will cut educational cost and provide a more personal touch to students while ensuring each student is receiving an education catered to his or her learning style, and it increases an instructor's ability to provide effective feedback and assistance. This changes the role of the class instructor to a class administrator whose primary functions are to guide overall content and ensure instructor aids are addressing their assigned category with effective teaching.

**4.2.5. Step Five: Learning Phase.** The learning phase provides a student-centric learning cycle to guide student mastery of the learning objectives of the course. This phase targets the whole person which includes ensuring that a student's psychological capital and mental agility are addressed within the content delivery methods. As part of the process, keeping track of a student's progress and presenting it as a score to show the student how he or she measures against their past progress and his or her peers is important to keeping the student motivated. Moreover, concepts from the Whole Brain Learning model are incorporated into each instructor's pedagogic style. Student learning should be repetitive to help them achieve mastery and students should not continue to a new lesson until they have displayed proficiency in the subject matter for the current lesson. Each cycle of learning should evaluate the student's psychological capital and mental agility so that the instruction and content remains student specific.

**4.2.6. Step Six: Student Mastery.** Student mastery is the demonstration to instructors of a student's understanding of course content. Traditionally, education has used tests to determine if a student has developed proficiency in a subject matter. This has always proven inaccurate because most standardized tests only target a specific demographic of learners. Tests have rarely been adjusted for the entire population of learners with different learning capabilities. Therefore, our proposed WSLM model uses a "Student Improvement Index (SII)" to determine if a student has mastered a subject matter. The SII is a measurement based upon the percentage of improvement a student achieves within a subject domain. Instead of giving a standardized test to display mastery, SII uses a student's current SCLI and compares it to his or her past SCLIs within the student's profile. This approach allows each student to be measured against themselves and against other learners in the same SCLI range rather than against other types of learners who might have an advantage due to the particular testing method. For example, a student has a current SII of 3%, which is the percentage of change between the student's previous SLCI average of .66 and the new SLCI of .68, upon the completion of course, assignments. The student did not display mastery since the SII is below 10%, in which mastery is only obtained if a student improves by 10%. After the student completes reissued course work targeting their weaknesses a new SII is computed. This iteration the previous SLCI average is .68, and the new SLCI average is .92, and the updated SII for this student would be adjusted to 35%. Therefore, mastery is displayed by the student since the student's SII improved more than 10%. This allows a student to be measured in his or her learning range and builds a student's confidence and learning capability overtime.

## 5. Application of Model

To present the model and how it addresses a student's cognitive ability, individual self-efficacy, self-esteem, intrinsic motivators and life coping survival strategies, and the interconnectivity of technology with these key elements; we will use the example below:

*Student A is taking an online English course.*

*His student profile entails an academic history grade average of 95.*

In the first week of the course, the student completes a student assessment (step one of the WPLM), measuring his mental agility. His student profile is created in Step 2, revealing he has a SLCI of .56. In the third step, the student is identified and categorized by his SLCI with similar students in the course. In the fourth step, the class instructor assigns an aid to each category of students based on his or her pedagogic style. As our student completes the learning stage of Step 5, the instructor approves customized course content presented by the instructor aid before it is provided to support all students within our student's category. In the last step, the instructor reassesses students in each of the category groups and computes their new SII in that subject domain. Student A's previous SLCI was .56. Upon reassessment, he has improved to .61, which gives student A an SII of 8%, below the 10% required for mastery. To address this, the instructor aid will provide more attention and feedback to the student's weakest areas along with additional modified course work to facilitate greater improvement. After Student A receives feedback and completes reissued course work the student is reassessed. Student A's

SLCI is now measured at .67, which updates his SII to 20%. This illustrates that Student A has improved and mastered the content of the given course week and can move on to new material.

## 6. Conclusion

Education is an important milestone in the course of modern human development, yet it is undergoing a vast paradigm shift with the explosive introduction of new and highly accessible technology. Our proposed Whole Person Learning Model answers this need for both online and traditional face-to-face educational structures with a solution that remains student-centered and adaptable. Our model combines clear identification of a student's learning and thinking styles, Herrmann's Whole Brain Teaching Model, a model of the student's individual coaching to identify intrinsic motivators, and other factors unique for the student's success such as psychological capital and affective environment. Through the application of this model, it is expected students will be able to take more ownership of their own education, encouraging them to become more motivated and self-guiding as they progress through life.

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## HEARING AID USERS: UNDERSTANDING THEIR DIFFICULTIES IN SOUND LOCALIZATION AND SPEECH RECEPTION WITH BACKGROUND NOISE

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### Abstract

Individuals with functional diversity associated with hearing loss show significant difficulties to locate the origin of the sounds and to understand the speech reception in a noisy classroom. The aim of this study has been to analyse the difficulties that interfere in different environments and situations to develop the skills to locate the source of the sound and speech reception in users of hearing aids. The method used to achieve this goal revolved around the creation of a discussion group formed by 6 children– 3 of them users of binaural hearing aids and the other 3 with binaural cochlear implants– whose ages ranged between 6 and 17 years old.

The information-collecting process was oriented to offer an individual and a collective description of the factors that interfered with the ability to adequately locate the origin of sounds and speech reception in the immediate environment. Our findings revealed that the main difficulty is understanding the speech in environments in which there is background noise. The paper concludes with a number of orientations and proposals which are likely to bring an improvement in the acquisition of skills in their ability to determine the location of a sound and to recognize speech in a noisy background

*Keywords: Hearing aids, hearing loss, discussion group, sound localization, speech reception in noise.*

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### 1. Introduction

Throughout history we have been able to observe how one of the great difficulties of the people with Hearing Disability was to obtain an adequate linguistic competence, since all the areas of the language were affected to a greater or lesser extent (Yoshinaga-Itano, Baca & Sedey, 2010; Triadó & Fernández Viader, 1992). In profound hearing loss, such was the linguistic deficit that was often labeled as "deaf-mute," which denoted their inability to learn to speak. The challenge that professionals faced for many years was to make the hearing impaired achieve a greater linguistic ability.

Fortunately, much has been achieved since then and things are currently very different. Nowadays, thanks to the technological advance of hearing aids and the early diagnosis of deafness, the acquisition and development of language can be achieved in practically the majority of cases. The early adaptation of cochlear implants and digital hearing aids has been a real revolution, making a complete change in the current scenario. Oral language is now accessible to the precocious ones. Following Jaúdenes, Monfort, Torres and Villalba (2004), children implanted before 24-36 months get a good perception of speech and a good self-control of their oral expression, which allows them to develop a very functional oral language. However, not only technological advances and early prosthetic adaptation have improved the auditory and linguistic performance of people with hearing impairment, as the current trend towards bilateral cochlear implants has contributed significantly to improving the threshold and auditory range of people with hearing loss.

Current research (Sparreboom, Langereis, Snik & Mylanus, 2014) has confirmed that bilateral implantation favors sound localization and speech recognition. Authors such as Steel, Papsin, and Gordon (2015) point out that children with bilateral implantation perceive the sound with less effort. However, although recent research seems to corroborate the benefits of a bilateral prosthetic adaptation (Goupell, & Litovsky, 2014; Jones, Kan, & Litovsky, 2014), there are several investigations (Aronoff, Freed, Fisher, Pal & Soli, 2012; Hancock, Chung, & Delgutte, 2013) which show that users with bilateral hearing aids still do not perform as well as normal hearing listeners in sound localization and understanding speech in noisy environments

Hence our interest in studying the current state of performance of the auditory abilities of sound localization and speech comprehension in noisy environments presented by people with hearing impairment with bilateral hearing aids is evident. Therefore, the research questions that are proposed to answer in this study are:

- To know the degree of difficulty that children with severe and profound hearing losses have with cochlear implants or digital hearing aids to locate sound and understand speech in noisy environments.
- To analyze situations in daily life that require locating sound or understanding speech in noisy environments that are problematic for children with hearing loss.

## **2. Methods**

The present investigation was carried out from a qualitative perspective, as its emphasis was focused on understanding the difficulties encountered by a group of deaf people in locating sound and understanding speech in noisy environments. In the qualitative perspective, there is an interest in understanding the subjects within their contexts or worlds of life and for this it is investigated by the representations and imaginary that people have of themselves, their groups, their environment, their daily life and their work (García, González, Quiroz & Velásquez, 2002). In the same way, the discussion groups were used and supported as a methodological approach.

### **2.1. Research Design**

The design of the research was supported by the procedural and technical conceptions of group discussion practice proposed by several authors, (Alonso, 1996; Callejo, 2001).

### **2.2. Formation of the Discussion Groups**

In the design of the meetings we did not look for the statistical representation but the typological one (Vallés, 1999). Owing to the above, this research was designed looking for the presence and, therefore, the representation of children with significant hearing loss (severe and profound) in which it was necessary the use of hearing aids.

As for the number of sessions Goldman and McDonald (1997) propose to perform about eight. However, since in this research the number of criteria was very small, it was not considered necessary to perform such number of sessions, so only two 45 minute discussion sessions were scheduled. The total number of children with hearing impairment who attended the discussion groups was 6 children aged between 6 and 17 years.

### **2.3. Selection of Participants**

As previously mentioned, the participants in the research have been children with severe and / or profound hearing impairment. In order to comply with the criteria for the design of the discussion groups, these children were selected through the Apanah Association (Association of Parents of Persons with Hearing Impairment). This association is born from the interest of the families of people with hearing impairment to defend the rights of the deaf and their families, both in the educational, health, social and labor fields.

### **2.4. Moderator**

The moderator's performance in the execution of the discussion groups was to propose the topic for discussion, and how to do it was what motivated the desire and interest to discuss it, as expressed Vallés (1999) in addition, the question-answer dynamics, characteristic of many research techniques, was transcended, promoting group interaction, a distinctive aspect of the discussion groups.

### **2.5. Discussion thread**

The discussion script was constituted with two sub-themes, one sub-theme was the location of the sound and the other sub-theme speech recognition in noisy environments. The first sub-item included 5 questions and the second sub-item included 7 questions.

### **2.6. Registration of information**

The dialogues and discussions generated in the discussion groups were recorded on a soundtrack and transcribed in magnetic medium, as suggested Canales and Peinado (1998).

## 2.7. Analysis of information

The analysis of the information began from the moment in which the discussion groups took place, during which the researcher took distance, since he tried to apprehend everything that had to be learned about the culture and the subject of study. It was based on the ability to view experience from the participant's perspective (Morse, 2003).

Through a codification process the information obtained in categories where the similar topics that have been identified are organized. After having listened and transcribed all the sessions in depth, and given the object of our investigation, we will divide the process of codification into two categories:

- A) Situations in which children find it difficult to locate the sound.
- B) Situations in which children find it difficult to understand speech with background noise.

## 3. Results

This section has been divided into two categories that represent the two major sub-themes of our study. On the one hand, in the first place, we will describe, under the perspective of the participants, all those units of meaning that have been inferred with respect to those situations in which to locate where the sound comes from represents a difficulty for children with hearing impairment.

On the other hand, in the second category are those situations that present difficulties to understand speech when there is background noise.

### 3.1. Inferential categories regarding sound location difficulties.

In this category, we will include all those narratives in which the students express all the difficulties they encounter in locating the sound. It has been divided into two main codes:

Code 1: Difficulty locating sound when someone calls us, especially when there are many people.

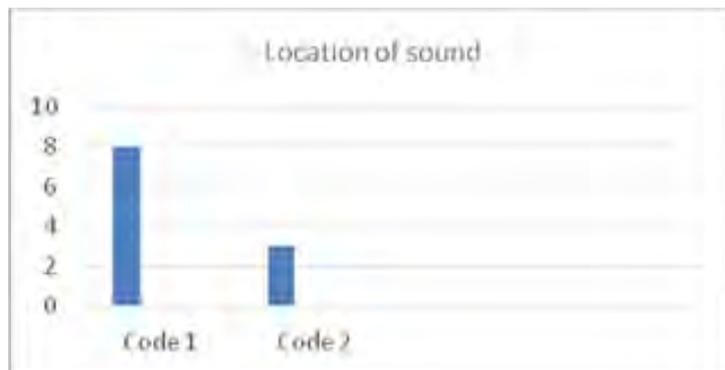
All participants allude at some point to the difficulties they have encountered in locating sounds in space. With a total of 8 narratives, we show an example of this code:

E.g.; In crowds of many people and call me, there are times I cannot distinguish where the voice comes from.

Code 2: Locate if the sound comes from the right or left side.

With less significant representation, this code is shown with a total of 3 narratives. Here is an example: E.g.; when they speak, I do not know if the sound comes from the right or left side.

Figure 1. Percentage of data obtained in the categories regarding sound location difficulties.



### 3.2. Inferential categories regarding speech recognition in noisy environments.

In this category, we will include all those narratives in which participants express what situations have been shown to have more difficulty in understanding speech in environments where there is background noise. Five main codes have been observed:

Code 1: In places where there is much ambient noise.

This category undoubtedly has been the most numerous in terms of narratives detected with a total of 9. E.g.; in the cafeteria when there is a lot of ambient noise.

Code 2: In situations where the caller is not visible.

The proportion of narratives found under this code is 3. E.g.; when lips cannot be read. I always need to read lips. When the teacher turns to write on the board and is explaining.

Code 3: In a class when there is a lot of noise.

This category assumes a total of 5 narratives. E.g.; in a class when there is row, I find it difficult to understand when the professor teaches.

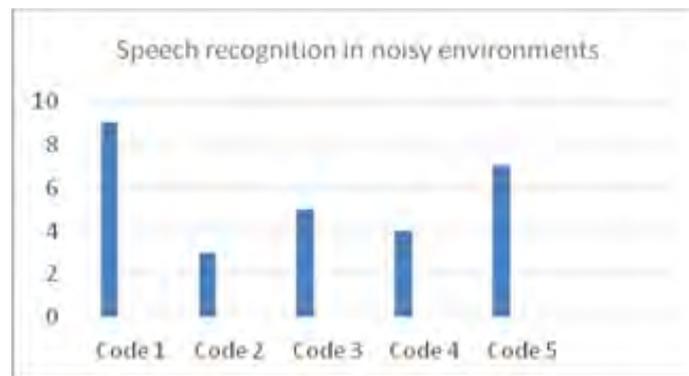
Code 4: Follow the conversation when there are several interlocutors.

The proportion of narratives found under this code is 4. Special reference is made to those difficulties that require a great effort on the part of the listener to follow a conversation. E.g.; when we are in a group and begin to talk is a little difficult to catch the conversation because sometimes they change the subject and you do not know.

Code 5: Hold a conversation when there is another background sound.

A significant presence with a total of 7 narratives means those involved in maintaining and understanding a conversation in noisy environments. E.g.; when there is loud music and have a conversation with music I find it hard to follow.

Figure 2. Percentage of data obtained in the categories regarding speech recognition in noisy environments.



#### 4. Discussion and Conclusions

According to the results, it seems evident that children with hearing aids have difficulties in both areas, localization of sound and understanding speech in noisy environments. Both abilities are essential for child can interact properly with the environment that surrounds him.

Focusing on the educational context of the results obtained, the idea that the difficulty of recognizing speech in noisy environments can significantly impair the child's learning within the ordinary classroom, since in a class the background noise is practically continuous. Thus, we consider it fundamental that teachers of children with hearing impairment take into account some considerations in the usual dynamics of their classes to keep a classroom as quiet as possible and so background noise does not interfere in the student learning:

- Conduct awareness campaigns so that children are aware of the importance of keeping the classroom silent.
- To write clear and concise rules so that children can participate respecting the speaking shifts.
- Placing carpets and furniture to muffle sounds.
- Place the child as close to the teacher as possible.
- Put subtitles in audiovisual material.
- When it is a class in which the children can intervene, use a microphone so that the child with hearing impaired immediately locate who is speaking.
- Putting rubber plugs on the chairs and tables of the class to minimize the noise of these.
- Using a personal frequency modulation (FM) system.
- When children are young, the teachers can improve auditory skills with activities in which the children have to locate where the sound comes from, or locate two different sound sources that have originated from different places.
- Provide access to lip-reading.

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## HOW TO USE ROBOTICS IN EDUCATION ACTIONS

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### Abstract

The extensive contact with various electronic devices and the massive implementation of the so-called Internet of Things (IoT) make children, from a very early age, interact with such devices more and more frequently, influencing everything from their habits and likings to their predisposition to absorb new concepts and ideas. A growing movement on the global stage is the integration of technological learning with the standard school subjects, in order to make the students put into practice the knowledge obtained in the classes, fostering the logical reasoning and stimulating the interest. This does not only in the courses of the Mathematic's area, but also in the courses of the Human Sciences', especially in those courses in which they find themselves discouraged in the face of more complex situations.

The use of educational robotics to stimulate student learning in the public school system is a reality in several developed countries of the world. However, this does not apply to Brazil, as this type of methodology is almost non-existent in the country's public schools. With educational robotics, it is possible to develop interactive, practical and playful learning instruments aimed at children and teens in order to, mainly, aid the theoretical knowledge of Mathematics and Physics areas, along valuable competencies like teamwork and critical thinking.

This work proposes the development of didactic material and application methodology of a mini-course of Educational Robotics for teachers and students of high school, being able to be adapted for other professionals and enthusiasts who wish to work with this theme. The mini-course covers the topics and concepts of electronics and programming based in Arduino Platform, aimed at presenting the main resources of this platform, both hardware and software, available to propose and develop educational projects. As a concrete development of our group, working at the Center InovEE – Innovation Center for Energy Efficiency, located at the Sao Paulo State University (UNESP), we will present and discuss the results of the application of a short duration course for high school students in the Vale do Paraíba region, Brazil, performed at the UNESP- Campus of Guaratinguetá.

**Keywords:** *Educational Robotics, Arduino, Robotics Platform.*

### 1. Introduction

Changing educational methodologies in order to cope up with the industries' human resources demands for new skills and competencies is an ongoing challenge. Accentuated in the late 20<sup>th</sup> century (D'Aveni, 1994) and in the 21<sup>st</sup> century, the search for individuals best suited for specific knowledge areas and social prowess has given rise to several new educational formats, as the traditional education system from earlier decades proved to be outdated to meet such standards.

Alas, most developing countries' schools does not apply such new methodologies in an efficient way, be it due to unreadiness of educators, lack of investment in education, or even lack of student motivation in specific subjects (OECD, 2013). To tackle such issues, some methodologies have been tailored and adapted according to such scenarios, providing training material for educators, developing interactive and challenging activities for students and doing so with reduced costs for low-income schools.

One such methodology is called “STEM Education”, in which educators encourages learning in Science, Mathematics, Engineering and Technology courses, crucial areas for developing competencies needed in the professional market that normally sounds unappealing in traditional teaching formats (Horta, 2013). The use of robotics platforms is commonly used in this approach, as it broadens the range of activities that educators can exploit, as well as the possibility to integrate project management tools in higher education scopes (Oliveira; Oliveira; Carvalho, 2016).

In Brazil's current scenario, public and private schools that implement this type of education format are few and far between, mostly limited to major institutions in big urban districts. As such, vast

majority of students up to secondary education are left out to keep an interest in STEM fields, thus compromising R&D capacity of the national industry. Nevertheless, in recent years, Brazil has invested more in Education, and more students in high school ages have been enrolled in school (OECD, 2016). This proves that, while there is much room for improvement in teaching strategies and how to motivate students, there is an aspiration towards better education by providing better equipment and teaching materials for middle and high schools, even when speaking of disadvantaged regions and socioeconomic classes.

Although this paper focuses on a mini-course about electronics, programming and robotics concepts applied to high school students, the elaborated material can be extended for longer workshops, semesterly or yearly subjects in schools, and even for tertiary education. Also, by gathering feedback from the students before, during and after the course is completed, educators can continually improve their teaching methods, giving flexibility and engaging incrementally larger group of students to STEM fields.

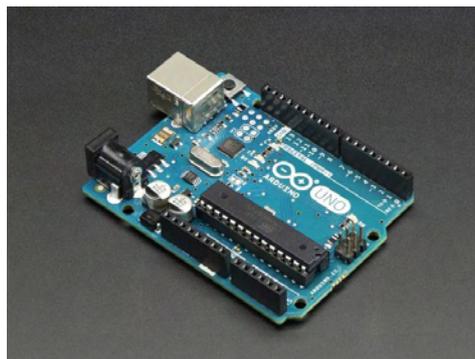
This paper is divided into 4 sections. The second section discusses the proposal of the course of robotics presenting the main phases of this course. In the third section is proposed a methodology for a robotics course application. The fourth section presents and discusses the results of the application of the robotics course within the activities planned for a Science Fair held at UNESP. And finally, in the fifth section, some conclusions of the work are presented.

## 2. Course Structure and Core Values

The main idea for the course is to be succinct, straightforward and as interactive as possible, so that the students do not feel discouraged by being passive listeners. To do so, the educator must indulge in the main concepts of the course, comprehend the desired learning curve, adapt its sub-concepts for the age and previous background experience of the students, and elaborate flexible and diverse applications for the studied topics. By doing so, not only does the educator can better apply the methodology through the adjustments during application its, but by identifying the students' potential skills and competencies, multi-task groups can be formed between students to maximize their success in activities and projects, while also fostering a friendly competition and rewarding creativity.

With this in mind, the course is divided into three main phases: theoretical learning, practical learning and project development. In order to maximize flexibility and cost-efficiency, the entire course is based on the Arduino platform, which is currently one of the most supported open-source platform (Arduino, 2017), while also providing easy-to-use programming language and extensive collection of electronic devices that can be connected to it. An image of one Arduino circuit board used in the course, Arduino UNO, is depicted in Figure 1.

Figure 1. Arduino UNO R3 board (<https://www.adafruit.com/product/50>).



In theoretical learning, students get to learn the basics of electronics and programming principles, going from units for measuring voltage and current, Ohm's law, primitive components, sensors, programming logic, flowcharts, conditional structures, and so on. The key factor in this phase is to supply the required knowledge to the students and how electrical circuits work, while stressing the core concepts repeatedly over the classes. Instead of focusing on overly complex mathematical equations and expressions in advanced circuit analysis, the educator can use simple examples that fit the reality of high schoolers, while still using basic expressions to convert electrical units, convert between number formats (decimal to binary, for example) and calculate voltage drops in simple resistor arrangements.

In practical learning, students get to sit in a laboratory and build the circuits and programs shown in the theoretical part to see their applications. The educator can use the first part of the class to remind

core concepts and do examples using new components or commands, while the second part is to be focused on the students executing the planned activities by themselves, in groups. Here, the educator is encouraged to build up the difficulty of the course planned activities incrementally, taking previous examples or activities' programs and circuits as a basis for more complex ones. Using programming good practices like using flowcharts to illustrate the logic of the intended functionality and dividing the main program in multiple independent, simpler functions instead of writing the whole program for the first attempt, is highly advised and encouraged so that the students can become more efficient and apply the same behavior outside the school.

Finally, the project development phase focus on evaluating how much content the students have absorbed, while testing their creativity, originality and developed competencies by means of implementing the learned concepts in a functional product based on what is available on the market or in their daily lives. In an application of the course, for example, one could take a modern car as a basis to introduce several concepts in electronics, such as applications of motors, LEDs (light emitting diodes), distance sensors, infrared receivers, LCDs (liquid crystal displays), and so on. Figure 2 illustrates that learning platform.

*Figure 2. Automated toy car as a robotics learning platform.*



Although this phase is to be expected in the last part of the course, it is recommended to approach this phase along the last topics of the previous parts, so that students can have time to look for inspiration for their projects inside the classroom and not be taken by surprise. As previously mentioned, the educator should ensure that the main goal of this phase isn't to prioritize time to completion or features involved in the project, but classify projects in more abstract terms, like regarding their originality, flexibility in operation, interactivity with the end user and visual appeal.

Along the entire course, the educator should provide and receive feedback for its classes as much as possible in order to acknowledge potential gaps in teaching methodology, opportunities for implementing new devices during the course development, discarding concepts that are hardly used in practical examples, and adapting the level of challenge for each topic. If possible, providing a communication channel like a blog or intranet community and encouraging students to share ideas, doubts, findings and developed circuits and programs is recommended to unify the classroom students and build up a sense of belonging between them.

### 3. Methodology

In the proposal of the actions foreseen for the application of the Robotics Course, we propose that every class will be the accomplishment of a complete activity, that is, development of software, hardware and documentation of the project. Therefore, the intention was to make all course activities to have predefined requirements enabling teachers to use technology as a tool in the teaching-learning process. These requirements were previously discussed by the team of researchers in order to provide participants with an overview and context of a problem so that they not only learn the necessary programming requirements but also learn concepts related to the development of electronic and mechanical systems (Hardware), and finally also have the capacity to carry out all project documentation. Based on the proposed actions described above the proposed course focuses the following issues during the execution of each lesson:

- **Contextualization:** The teacher must present the characteristics around a certain real problem of any area to start a discussion of the subject with the students participating in the course. The problem can be about any area of knowledge, such as: telecommunication, transportation, entertainment, etc.

- **Material:** It is the moment when the student gets to know the devices (hardware). At this time, students will also be presented with the measuring equipment normally used as support tools during assembly of the hardware. It is of fundamental importance that the student understands not only the main characteristics of the equipment but also how the components relate to each other before starting the assembly of the schematic circuit itself.

- **Assembly:** The time at which students will assemble the hardware. This step is extremely important because the students will perform previously discussed actions and at the end of this stage they will gain confidence to work with components, wires, measuring instruments and with the breadboard.

- **Flowchart:** At this moment concepts of logic are presented to the students, that is, they will understand the flow of information and the actions of the experiment, developing the concepts of logic with ideas that will be used in the programming.

- **Coding:** Here the flowchart is translated into code (software), the student will learn the syntax of the instructions and how the programming language can help in solving the problem.

- **Characterization:** At this moment the students will do the integration between hardware and software of the proposed project. The verification tests will be performed to prove the operation of the experiment according to its previous specification.

- **Discussion of the results:** The conclusion of the lesson is presented by making a correlation between the activity performed and something that is part of the daily life of the student. The teacher should also instigate and propose changes in the proposed project, always questioning the students what the consequences of such changes would be. A good practice, too, would be to suggest a challenge to the participants linked to the concepts presented during the lesson.

#### 4. Result: Pilot Project Implementation

A pilot application of the Robotics Course was conducted within the planned actions of a Technological Fair called EXPRECI - Regional Exhibition of Engineering and Science, in the form of a Robotics Workshop aimed at high school students who, for the most part, had not had any previous contact with robotic platforms or the like. The activity lasted 2 hours and each class had 21 students who were divided into 7 groups of 3 students each. The proposed activity consisted of 3 complementary projects, and in each project each of the group students had to perform a pre-established action. In the first activity one student was responsible for the development of the project software, the second participant of the group was responsible for the development and assembly of the hardware and the third one was responsible for the documentation of all the stages of development of the project. At the end of each activity, the members of the group took turns and began to develop a new activity. Therefore, at the end of the three activities all the members of the group had participated in all the planned actions of the Course, that is, development of the hardware, software and documentation of the project.

The course was applied in 3 classes totaling the application in a group of 63 students. The team responsible for the application was composed by lecturers and tutors linked to the Center for Innovation in Energy Efficiency - INOVEE of the Faculty of Engineering campus of Guaratinguetá.

At the beginning and end of the activities, questionnaires were applied with the intention of evaluating the results obtained from the application of the course. The table 1 presents the questions answered by the students before the beginning of the course activities.

Table 1. Questionnaire and its results before the application of Robotics Course.

|   | Yes | No |
|---|-----|----|
| Have you heard of robotics?   | 60  | 1  |
| Have you ever wanted to create some electronic equipment?             | 33  | 28 |
| Are you curious about how electronic equipment works?                 | 46  | 15 |
| Do you know how to relate robotics to things from your everyday life? | 41  | 20 |

From the obtained results we can affirm that the great majority of the students (60) had already heard of robotics; moreover, most of them (41) knew how to relate things of their daily life to robotics. It was also very interesting to know that most students were curious about how electronic instruments work.

Table 2 shows the results of the application of another questionnaire to the students after the execution of the expected activities of the robotics course. From the results presented in table 2 we can conclude that the participants approved the proposed format of the Course, since most of the students liked to carry out the activities, were motivated during the execution of the tasks, and also approved the content presented in the Course (answers to questions 1, 3, 10 and 11). The dynamics adopted for the course were also approved by the students, since the great majority liked to work in groups and felt that the group work helps their learning process on the robotic theme. A point to be worked on in the next

applications of this course refers to the use of the platform of programming of the Arduino based in the IDE, since the great majority of the students informed that they had difficulties in the use of this interface. One option would be to use some graphical interface to accomplish this task.

Table 2. Results obtained after the application of the Robotics Course to high school students. \*

|   | Strongly Agree | Agree | Disagree | Strongly Disagree |
|---|----------------|-------|----------|-------------------|
| 1). Was there anything interesting at the beginning and during the realization of the Robotics Workshop that caught my attention? | 16             | 36    | 4        | 2                 |
| 2). Was there anything during the Robotics Workshop that was demotivating?  | 3              | 17    | 28       | 10                |
| 3). Did I enjoy doing the activities?   | 18             | 30    | 6        | 4                 |
| 4). Is the content seen during the workshop related to things I already knew?   | 4              | 14    | 24       | 15                |
| 5). Can I relate day-to-day situations to the subject of the workshop?  | 17             | 24    | 15       | 1                 |
| 6). Did I feel that the proposed activities are appropriate for my level of education?  | 12             | 30    | 11       | 4                 |
| 7). Did the laboratory experiments favor my development to work in a group?   | 20             | 34    | 3        | 0                 |
| 8). Did the development of group activities during the experiments help my learning?  | 15             | 33    | 8        | 1                 |
| 9). Did I have difficulty working with the IDE programming platform?  | 16             | 24    | 14       | 3                 |
| 10). Did I enjoy performing the activities of the Robotics Workshop?  | 18             | 28    | 8        | 3                 |
| 11). Did you like the content presented in the Workshop?  | 17             | 29    | 8        | 3                 |

(\*) Some students did not answer the questionnaire.

## 5. Conclusion

In this work, we present a methodology for the application of a robotics course for high school students based on three main actions: learning of theoretical concepts, practical learning and execution of a robotics project. In the proposed methodology, the following questions should be worked out during each lesson: contextualization of the problem, material, hardware assembly, flowchart and coding (software development), characterization and discussion of the results. From the application of the course, we can also conclude that the realization of a dynamic in which the students work in groups executing all the planned actions (development of hardware, software and documentation) contributes to the participants' extremely high degree of satisfaction.

The teaching of robotics is often mistakenly seen only as an exclusive tool for developing knowledge in the field of earth sciences. However, in the hands of an experienced educator having a supporting material and using an efficient methodology, different areas of knowledge can benefit from such learning, such as Music, Arts, Languages and Codes, Sciences, among others.

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## LEARNING CLASSICAL MUSIC THROUGH IMPROVISATION: (A NEW APPROACH?) INSTRUCTION FOR USE

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### Abstract

The author takes the cue from some historical considerations about modern teaching & learning process in classical music. While in the past most renowned musicians have considered improvisation and composition as a complementary aspect of performance, today for almost all music students the practice of improvisation seems to be not necessary at all, and often only a very basic knowledge of harmony and theory is requested to complete their studies. Presently it is very rare to find a classic music student able to improvise a short prelude or compose a little music piece with confidence. Investigating possible reasons of this shift, we may notice that by one side since the last post-war a remarkable significance has been given to technical approach, on the other side music teaching has been reduced essentially on the reproduction of the symbols of the music score. In order to re-establish the lost balance among improvisation, composition and performance, the author proposes a different approach to classic music, starting from improvisation and consequently understanding of musical structures. In his almost ten-year experience of teaching in Asian countries, he developed the idea that the proper way to approach classical music should not be based on a mere reading of the notes without awareness of the musical structure, as well as fulfilment of a given composition should not be based on reiterated mechanical repetitions of the same passage. The author elaborated a simple as well as efficient method to introduce students to improvisation: starting from the invention a melodic and/or rhythmic fragment, the student is led step by step to the creation and completion of the musical piece. During class students have chance to discover, experiment, test diverse possibilities and get familiarity with essential elements of the music. The study of improvisation let students look at the music under a different perspective: it represents a valuable support for the real understanding of the music score, an aid to penetrate composer's mental process and an unique way to learn how to create music.

**Keywords:** *Improvisation, piano pedagogy, learning process, practicing methodologies.*

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### 1. Introduction: an overview of modern teaching & learning process

If we tried hypothetically to mark a sort of analysis of history of music pedagogy related to instrument learning & practicing process, we would notice surely many changes over the last 200 to 300 years. Taking back a look to history we can easily observe that Bach, Mozart, Beethoven, Chopin, Liszt, Brahms and Rachmaninoff (our list is much longer) were excellent improvisers and composers, not only performers (Burkholder, 2014); in their time improvisation and composition were considered essential skills of any musician (Ruiter-Feenstra, 2011). And many musicians - at least until the romantic era - were able to realize a basso continuo on the keyboard (Cooke, 1999). Present situation is severely changed: it is rather difficult to find an environment where students can seriously study improvisation, counterpoint and basso continuo as essential training to their music studies. Conversely, priority is normally given to accuracy of notes. Often, we must say, the necessary historical perspective lacks, and consequently a real understanding of the music and the composer's thought (Firrincieli, 2016).

It would be impossible to analyze in its wholeness this drastic change in the educational background, nevertheless we may partly explain it comparing some differences between modern musicians and their colleagues in the past: presently the performer is no longer a composer/improviser, and in turn teachers may never been performers. In my opinion, one of the worst consequences of this decline is the loss of the true understanding of music notation. The modern incomplete musicians have never used notation as a means to intentionally write down their musical thought (Schenker, 2002). They have merely used it passively, without real perception of it, as a necessary set of symbols which convey meaning in a written form. Being unable to use the notation in this way, they will be unable to decode the original meaning of a score, focusing on the most superficial and external aspects. Without any intention to generalize, I have noticed this situation in both academic environments, music schools and private classes teaching.

## 2. Improvisation: how to start

The attention to improvisation is unfortunately often missing in methods dedicated to beginners, as the priority – for teachers as well - seems to be the learning of name of the notes. The originality of the approach I propose, consists in the absence of music score at an initial stage, as well as in the use of a very simple material, easy to understand and manage. I am persuaded about the usefulness of a practical and immediate approach for unexperienced/beginner musicians – as well as I am strongly persuaded about the importance of a qualified and experienced teacher since the beginning. Without him, even the best benefit of the world best method would be nullified.

## 3. Rhythm

Starting with the study of rhythm, I propose to begin by improvising simple rhythmic fragments. A row of two beats (or two notes) represents already a good starting point for many students. In the following examples I show some possibilities:

Figure 1. Examples 1a, 1b, 1c.



The teacher may show this examples by singing, or either playing a keyboard or a percussion instrument. As shown, a little accent may emphasize either the first (example 1a) or the second note (example 1b). In the example 1c, neither of the two beats - or both of them - are played with particular emphasis. The student will be asked to repeat and copy the rhythmic pattern by using the same and then different notes on the piano. Same exercise may be reproduced using some percussion instrument in order to focus student's attention solely on rhythmic element. Since the very beginning, teacher should focus on student reaction, his participation, his personality, and he should try to stimulate his curiosity by showing, if necessary, some plausible music variants. The next step, according to student's skill, may be either represented by examples 1d and 1e, or 2a and 2b.

Figure 2. Examples 1d, 1e.



Figure 3. Examples 2a, 2b.



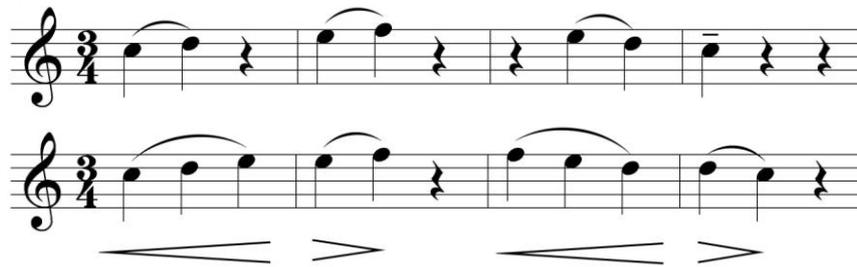
In the examples 1d and 1e I propose a variation of the articulation (a percussion instrument is not recommended here): the different articulation modifies the duration of the single notes (long-short and short-long respectively), while Examples 2a and 2b simply add a third beat to the original set. Examples 1a-e may be also explained to student by comparison to qualitative languages and metric accents (Gentili, 2003) of ancient Western languages. Sadly, one of the very neglected aspects of the modern music teaching is the proper accentuation in music, especially in the study of the music of classic era (Fadini, 2009). In my opinion, with this approach the music articulation should receive the necessary attention since the beginning. Hopefully, the clever teacher would support the student with further considerations about importance of accentuation in music by comparisons with languages.

After have practiced these examples, student should be invited to extemporize some easy rhythmic patterns by combinations and/or repetitions. Teacher should be able to show some good model in order to encourage and to stimulate student to create interesting patterns. Besides, he should also be able to accompany the student integrating musically and logically his improvisation. I have noticed that beginners had much more benefit by working hands separately during their apprenticeship, starting with easy structures and progressively making them more complicate. Paradoxically, an easy music piece for two hands represent a much harder obstacle for many beginners. Some example of teacher-and-student improvisation may sound as follow.



in the study of first species counterpoint - the restriction of available intervals represents a way to develop student's compositional skills. As said, teacher should be able to provide student good ideas and to offer him good models. Below some examples (for commodities melodies are notated in C major):

Figure 8. Examples 7a, 7b.



In parallel with student's musical sensitivity and good taste, specific attention should be given to phrasing and articulations since this very first step. Student should be trained in paying attention and respect to phrasing, accents and, much more important, character and direction of the melody. All these elements are absolutely much more relevant than notes themselves.

Figure 9. Example 7c.



After the student has composed his melody, teacher should let him improve the melody through the use of questions. Let me make some practical example: if the student plays a melody with a repetition like the one below, the teacher may ask whether the repetition is what is really wanted or a one-tone-up transposition of the last two bars may make the melody more interesting. Do notice that teacher suggestion should not be intended as a must, if the repetition is what really the student wants, the melody should not be modified. Teacher suggestion should be just a spark for further considerations. When the student will be able to shape proper a melody, teacher may ask what articulation he intends to use, proposing for example these ones:

Figure 10. Examples 7d, 7e.



Leaving the student free to choose any of them or rather find out a new one. Direction and orientation of the melody should be always clear. Since the beginning student should be able to identify the climax. Whether or not student is able to identify it, do not lose the chance to study some music masterpiece in order to discover how greatest composers have used music material.

After student has created some melodies, it should be asked him to transpose some of the melodies in different keys, either respecting original intervals or changing mode; I recommend to not limit student to the use of major/minor modes only. Melodies should never be intended as finished and unmovable: the more the level of the student grows, the more he will be able to highlight undiscovered corners and find out new solutions.

## 5. About the importance of a correct teaching method

It should be understood that an approach where the teacher proposes his own corrections/solutions and the student accepts whatever the teacher does should be strictly avoided (Firincieli, 2016). Teacher's role is very delicate, especially at a very young age; his advices are usually intended as a prohibition to proceed in a different way, and young student do not have usually a strong critical sensibility. Besides, a chance for further student's understanding and investigation would be lost. Music should be seen as a problem to solve, and solution should not be provided by teacher (except in some cases); by doing this constantly, student's learning process would be irremediably corrupted. The clever teacher will be able to let student think, find out different solutions, implement student's skill and

lead him to more complex achievements. I would suggest to always follow student's attitude at the beginning: if a very creative student shows the wish to improvise and create by himself some new music elements to use, his intention should be supported and encouraged. Let him combine music fragments, playing them with alternate hands, or simply propose them to have fun showing them some possibilities. At the same time, teacher attention should always monitor student's choice, trying always to let him learn and optimize efficiency. A teacher has to be flexible without thinking with established mental patterns or fixed structures (Lipman, 2013).

## 6. Conclusion

It should be taken for granted that the comprehension and appreciation of music written by composers who worked assiduously as performers, improvisers, composers and often conductors cannot be fully understood limiting our approach to a mere performance, as well as great baroque masterpieces cannot be approached without a deep knowledge of counterpoint and its rules (Geoffroy-Dechaume, 1988). It would be like learning a language by reading only, without any conversation class and written assignment. If we wish to truly rediscover and fully enjoy music of the past, serious studies in improvisation as well as in composition should be included regularly in our modern music curriculums, especially at a beginner level. A second reason I would mention is about motivation: for a young student a music class where improvisation is taught since the beginning, and where music is proposed as a creative game or like a problem to be solved, sounds usually much more interesting and stimulating than a class where he has merely to read a music score and follow teacher's instructions. Unlike many standard methods, priority here is not given to the reading of the notes; conversely, the notation would simply represent the arrival point, intended as full understanding of the meaning of the symbols notated in the music score. Since the beginning, student is stressed about the importance of dynamics, accents, articulations. Not just as part of the music score to be reproduced, but as essential part of the musical discourse with their own different meaning according to the author, the period, the geographical origin of the score. The uniqueness of this approach consists in the starting point of the learning process: nor from the notation neither from the symbol itself, but from the sound of the notes, their relations into an organized language with its own rules and its musical meaning. In this article, music examples are obviously represented by the use of music notation, nevertheless I recommend the teacher to work without any written support, at least at the very beginning. "When" music score should be introduced in the class cannot be categorically said. However, I would suggest that student should familiarize with improvised music first, by singing and playing a music instrument. After student will have possessed the rudiments of improvisation - including meaning of accents and dynamics, direction of a music sentence, phrasing and articulation - writing and reading of the notation could be introduced progressively. In my opinion, the reason why sometimes students don't really care about music symbols or misunderstand the real meaning of the notation, finds its origins in their false approach to music: they are usually stressed about accuracy of notes and technical issues, and as a direct consequence, a performance without any wrong note is considered already an enormous achievement (often with the complicity of their teachers). Last but not least, students will develop their own self-control and responsibility, they will improve their creative skills, and they will train their imagination – one of the most important characteristics of a good musician.

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## TEACHING HEALTH SCIENCE IN GENERAL EDUCATION

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### Abstract

For all students, learning health science is as important as learning mathematics or writing. In general education, the emphasis is on reading, writing, arithmetic, critical thinking, and communication; this article claims that teaching health science to all students is equally important. Students come to school with a hope that school is the place where they can learn to change their future regarding their social value and financial outlooks. The author claimed that academic achievement could only provide little benefit to a student who suffers from chronic debilitating health symptoms. Even a healthy person needs to learn how to stay healthy because s/he may lose many influences in the academic and in real world if s/he becomes a victim of a wearying disease. After the completion of the degree, to move forward in life, a good health remains as essential as a good academic achievement if not more. After a degree is complete, the diploma and the record of academic achievement will stay with the student for the rest of his or her life; however, good health will always require their attention and remains a prerequisite for success.

By looking at the social aspect of it, one can hardly overemphasize the fact that health care cost is increasing significantly in the US and in many other western nations. The solution to such escalation lies in the old proverb, "Prevention is the best cure." But, the focus of mainstream research is on maintaining the symptoms of diseases—not on preventions.

This article brings to focus that almost all serious health afflictions are rooted in habits. Their symptoms always start inside the body, but the internal mechanism of the body continuously repairs the small damages caused by habits. Unfortunately, as people age, body's capacity to make necessary repairs diminishes often requiring medical intervention, but medicine can suppress the symptoms—it cannot cure a body, which has lost its ability to self-repair.

The author claims that achieving and maintaining good health requires lifelong learning. It involves listening to the body. Through the immune system, a body continuously communicates to its resident, but then again, some contacts come through only when it is too late—it is just a message that a severe damage has occurred such as high blood pressure, diabetes, and stroke. This article discussed some new developments in health sciences that all students need to know to protect themselves from these deadly diseases and argues that, for this purpose, colleges and universities can be venues for all students.

**Keywords:** *Arterial Calcification, Chronic Disease, Health Science, Lifelong Learning, Menaquinone.*

### 1. Introduction

Good education, personal and professional growth, social and financial success, and even life's overall happiness significantly depend on a single factor—good health. In short, to attain the *arête* of life, good health is necessary. Good health does not mean that one must be a weight lifter or a marathon runner, nor does it require spending disproportional amount of time to working out at a gym. What it means is that all physiological functions of the body are undisturbed in carrying out their jobs and are not interfering with each other, which may lead to physiological disharmony. However, if such disharmony sets in, our body sends the signal in the form of symptoms. Highly technical and costly treatments often tailored to killing the symptoms; it is just like killing the messenger, which then keeps the cause intact, but then again, the cause and effect are inseparable; therefore, the effect is bound to show up in a different form, which in turn necessitates a new treatment. That in part explains why the solution to healthcare is so difficult. Referring to US healthcare expenses, Kawachi (2004) wrote, "We make up just 4% of the

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world's population, yet we expend about half of all the money spent on medical care across the globe" (p. 21). This cost does not include the cost of productivity loss and the cost of suffering. Of course, there is a bright side: when a sick person makes a visit to a doctor and purchase necessary medication, the related medical expenses become a part of the GDP. This is a paradox of free market economy: being ill is, in part, good for the economy! Even this bright side becomes dim when one considers the fact that most pharmaceutical manufacturing facilities are now located overseas; therefore, the consumptions of those products, in fact, reduces GDP. Today's cost related healthcare crisis points to what Scruton (2012) wrote in a different context, "Human beings endlessly create problems for themselves, but they also find solutions" (p. 31). Not only that, with the profit motive in mind, they often create a complex solution for a simple problem.

Proper education helps us not only to recognize the paradox of reality but also to live with it. Do we need the doctors and pharmaceutical industries? Of course, we do, but then again do we want to be sick and dependent on them—let alone become dependent on imported medicines? The rational response is "No, we do not." For an individual, when a proper education does not equate to good health, one can conclude that the education is incomplete. A rational argument will lead to the conclusion that we need doctors, hospitals, and pharmaceutical industries, but then we also need to know how to stay healthy as well. Furthermore, we also need to know what habits and practices lead to ill health so that we can avoid those habits and replace those habits with that of the ones that keep us healthy. For that learning, the school is the best place—especially as a freshman when students learn various strategies for success.

Regardless of their majors, during those years, when the emphasis is on reading, writing, communication, and critical thinking, an equal emphasis on learning how to stay healthy can make a big difference in students' lives. Moreover, institutions can make available a centralized database with tools and tips for all students to continue learning the subject of good health so that they can review the necessary tools, tips, and latest findings at their convenience during their entire college journey. Many large colleges have writing labs and math labs to help students to use those in improving their writing and math skills. Similar resources such a health lab, when available, can provide students health-related coaching using the latest developments as those come to light through various researchers. This article consolidated some of the health-related areas that students can continue to learn during their college years and even after they graduate since even after graduation, a good health is necessary for achieving their highest goals in life.

In his book, *The Book of Life*, Upton Sinclair wrote, "No matter how busy you may be... it will pay you to get such things straight: to know a little of what the wise men of the past have thought about them, and more especially what science with its new tools of knowledge may have discovered." Staying healthy is an individual responsibility and relinquishing that responsibility to others, sometimes, not only produces undesired results but also costs the family a financial fortune; see (Li, 2016). Assuming this responsibility will not protect us from certain pain and suffering, but those pain and suffering match with Zautra's (2003) statement, "Pain and suffering are prerequisites for the development of the most positive features of our identities" (p. 131). This article sheds some light on the new developments in health science; knowing this may help us to adjust our lifestyle and derive the benefit of not only staying healthy but also living lengthier lives.

## 2. Circulatory System

Gaukroger, (2002) claimed, "The circulation of the blood is the basic feature of animal physiology on Descartes' account...more generally, circulatory systems would seem to be distinctive of living things, for they are tied in with respiration which is crucial in the circulation of the blood, nutrition, in the circulation" (p. 184). Obstructed circulation leads to many health afflictions including heart failure and stroke, which is the leading cause of death and disability in the US. For this, diet is the leading cause (Greger, 2015). To sum it up, the major cause of death in the US is rooted to eating habits. To keep the circulatory system functioning properly, the first order of business is figuring out how it clogs. The circulatory system is almost 60,000 miles long (Aird, 2005). The heart pumps blood throughout the entire system to oxygenate various organs, and the heart does it constantly day after day even when we are at sleep. For a partially clogged system, the heart must work harder to pump blood. Too much pressure created by the heart to force blood through the narrow opening of partly clogged blood vessels leads to hypertension and may eventually lead to full-blown high blood pressure. Unmanaged stress also eventually contributes the clogging of arteries. Persistent stresses cause the hardening of arteries through micro tears in the inner wall of blood vessels. Those micro tears eventually lead to calcification of the vessel walls narrowing the passage for blood to flow. That is the reason, it is told that managing the self, and comforting the self at the time of adversities is one of life's most important skills. According to Peck (2003), one of the properties of life is that, "Life is difficult," and that the problems of life grow as the

individual grows. Prevailing perception is that events of life are often stressful; in fact, it is the interpretations of events that cause the stress (Seligman, 1991)—not the events. Our actions are rooted in our perceptions of reality; this perception is our paradigm. For that reason, seeing reality objectively is so important (Senge, 2006).

One of the expected outcomes of education is that education disciplines an individual to see reality objectively. In this regard, assuming responsibility (Peck, 2003) is the starting point. We all can benefit from knowing how stress and anxiety can cause inflammation in our body, and how this inflammation can damage the inner walls of the blood vessels which lead to calcification and plaque buildup narrowing the passages through which blood flows, and how this narrowing leads to high blood pressure. Knowledge and good thoughts are useful only when those guide us to right actions. One of the most important actions related to good health is what, how, and when we eat. It is not just the prevention of calcification; we also need to know what new developments in science are for removing the plaques and softening the arterial walls if the calcification and the hardening of the vessel walls have already occurred.

## 2.1. Digestive System

Not just for maintaining healthy blood vessels but also for proper functioning of all the organs and the regenerations of cells, our body synthesizes various compounds from the food we eat. Our body is continuously regenerating itself; even the entire skeleton of the body regenerates in 7 to 10 years (Wade, 2005). This reaffirms the prevailing axiom, "You are what you eat." This is good news since an individual can choose to do something so simple as to eat right to stay healthy and to avoid the leading cause of death for a long time. It should be clear that good food is necessary in this case, but it is not sufficient. Good food cannot give us immortality or even the fountain of youth. However, it is good to know that a majority of health afflictions are rooted in what is happening in the gut. In many cases, health and illness are the results of various gene expressions, and through epigenetic research, now we know that it is possible to influence even various gene expressions through lifestyle changes, specially changing food habits. Various organs carry out orders from the brain to produce chemicals in responses to internal and external stimuli.

Each body consists of two brains—the head brain and the gut brain. Excluding exceptional cases, our thoughts influence the head brain and the food we eat influence the gut brain. To keep the body healthy, the alignment between the gut and head brains is necessary. What it means is that we cannot compensate the effect of bad thoughts that cause stress and anxiety with good food; similarly, we cannot compensate the consequence of unhealthy food in our body with good thoughts in our minds. For some reason, if our digestive process is disturbed or the state of anxiety is elevated, organs may even end up producing chemicals that are harmful to the body. Billions of workers inside the body also carry out the chemical production processes—these workers are microbes. Inside our body, especially the digestive tract houses trillions of microbes (Cani & Knauf, 2016). This is one of life's mysteries, which science is still trying to understand fully. The number of those living organism is so large that we have 10 to 1 ratio of the microbe to human DNA in our body. Those microbes have three general classifications: good microbes (30%), bad (20%), and opportunists (50%). When the body is healthy, we have enough good microbes doing what they like to do—keep us healthy, and opportunist microbes support them. When the proportion of bad microbes goes up, symptoms of a disease shows up, the opportunist microbes, like swing voters, support the bad microbes. The symptoms of many diseases are the message from the body either that the depletion of the essential molecule has occurred or that the higher proportion of microbes are working against the body; in some cases, it may be even both. One can easily see why suppressing the symptoms of the disease is so dangerous; it is almost asking the body to stay quiet. Autoimmune diseases, although not fully understood, occur when the body's immune system attacks parts of the body. Those diseases are the result of body's immune system failing to distinguish between a friend and a foe, and it attacks a friend thinking that it is a foe. Medical science has yet to come up with an explanation as to why this happens. The scientific answer we have at present is like a metaphor Branden (2001) used. He wrote about a distressed mother who took her child to a doctor to find out why the child was refusing to drink milk; after a careful examination, the doctor concluded that the reason is that the child is not a milk drinker. This answer did not help the mother since she knows that drinking milk is natural for a child.

The hypothesis of this article on autoimmune disease is there are two homologous possible pathways through which this may manifest. First, due to a long suppression of various symptoms and exposing the body to various synthetic chemicals or toxins, the immune system is malfunctioning. The second pathway is the increase of the proportion of bad microbe leading to immune system malfunction. In the case of chemical accumulation, it is possible to remove those chemicals from the body to restore balance. For that purpose, if the body needs some essential molecules, it is possible to compensate for those essential molecules created by using biosynthetic methods in vitro and made

available for the body to absorb, or when applicable, increase the number of good microbes who can synthesize those *in vivo*. The author has arrived at this conclusion by reviewing the work done by Guarente (2011) from MIT, Sinclair (2003) from Harvard Medical School, and Metchnikoff (1908) from Pasteur Institute. The regenerative properties of living beings are the biggest mystery of the universe. Unless the body has gone to the point of no return, for most illness, it is possible to use the regenerative process to reestablish body's normal functioning—mostly through purging accumulated toxins and proper supplementations. Illness due to the total loss of body's capacity to repair and regenerate cannot be cured solely by modern medicine—it can only sustain the suffering and often leave the family with grief and, often, financial ruin.

### 3. Supplementation

One may validate the belief: if we eat right, then we do not need food supplementation, with the premise that we can get all our daily nutritional need from food. This is also often supported by the claim that food supplementation is simply a waste of money since it only creates expensive urine; meaning that since the body does not need the additional micronutrient than what it gets from food; therefore, the body just releases those additional micronutrients through urine. This is true that to maintain good health, ideally, we should be getting all the needed nutrients from food. This is not true in most situations for two reasons: first, due to modern agricultural practices, most agricultural lands are devoid of many essential minerals. The second, processed foods and even fresh vegetables at the grocery stores often have long mileage on them. In addition, these foods often go through treatments for a longer shelf life. Not only that, if one considers the presence of trace amounts of pesticides in the food we consume, and possible long-term effects, including the visceral abdominal adiposity that elevates cardiovascular risk (Jacobellis, 2009), of consuming genetically modified food, one can draw the conclusion that food alone is insufficient to assure the supply of all essential micronutrients necessary for good health. (See WHO Study Report, 1990).

What is the best strategy—one may ask. Regarding health, first, we need a paradigm shift: changing the concept of eating for pleasure to eating for good health. This shift is the most difficult one; it may be even impossible for some people who will benefit the most from this shift. Second, eating less (Sinclair, 1911), and consuming only the food that will nurture the body. Third, refraining from the consumption of foods that feed the bad microbes in the intestine. By not doing so, one energizes the enemies within—this is a self-destructive food habit. Fourth, avoiding all foods containing high sugar and salt, which cause inflammation. It is important to recognize that inflammation is the main pathway to arterial calcification, which leads to high blood pressure, diabetics, and stroke; not only that, it also leads to obesity, which is a global epidemic (Pizzorno, 2016), and is one of the main health concerns in US. Fifth, giving the digestive system enough time to digest and eliminate the ingested food through the normal elimination process. Undigested foods rot in the gastrointestinal tract, and bad microbes thrive on those. Sixth, avoiding smoking and limiting alcohol consumption, including red wine because one may have to consume too much of it to get the benefit of Resveratrol. Seventh, consuming foods that are rich in polyphenol and fiber, and supplementing food with micronutrients and probiotics (Metchnikoff, 1908). In addition to these seven food habits, four other habits will benefit health. First, regimenting moderate exercise, deep relaxation, and 7-hours of sleep each day; in addition, practicing exposure to a full spectrum of light. Second, having good friends, and spending time with them to share hope and joy. Third, helping someone who can benefit from our help and support. Fourth, making selective reading a part of the daily rituals.

Science has discovered many miracles: The Menaquinone discovery is one of such miracles. The calcified and hardened arteries (Maresz, 2015) are the root cause of deadly cardiovascular disease and stroke. These created a tremendous economic burden in the US and globally (Benjamin, et al., 2017). Menaquinone, also known as vitamin K2 (Booth, 2009), which in the form of MK-7 (Theuwissen, Smit, & Vermeer, 2016), along with D3 can reduce arterial calcification by removing the calcium from the partially clogged arteries and sending those to where the calcium belongs—in the bone. Clean arteries help the heart, which is not just an organ of love—it is the organ of life. The brain may regulate vital functions of the body, but, without oxygen, the brain cannot survive more than several minutes. In short, the heart keeps the brain alive by supplying oxygen through blood flow.

### 4. Conclusion

A significant but partial solution to the impending health crisis is proper education to all students so that they learn to assume full responsibilities for their health. In the US, the spending on healthcare cost has escalated almost at a crisis level. A nation cannot solve this crisis just by increasing funding for

health care costs. The real solution will come from reducing the number of people who are in the pipeline of getting sick in future. This reduction can happen through proper health education to all college students with an intention of connecting the Mind, Brain, and Education (MBE) to a central issue of health. Regarding MBE, Stein & Fischer, (2011) reported, "The first such graduate-level academic program was started at the Harvard University Graduate School of Education in 1999" (p. 55).

In most colleges, general education (GE) curricula focus on improving students' comprehension, writing, critical thinking, problem-solving, and communication skills. For the benefit of the individuals and the benefit of the society, such curricula need to include health education. Doing so is now a social responsibility. Through such enhancement of GE programs, colleges and universities can also bring to the forefront the new developments in health science so that all college-going students can have MBE program related to health. Such a program will guide the students to continue learning; and as they produce results from their learning, they will be empowered to become lifelong learners of good health.

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## DIFFICULTIES ASSOCIATED WITH TEAMWORK IN A PROJECT-BASED LEARNING EXPERIENCE

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### Abstract

With the aim of reproducing in the University the labor world to which the graduates will incorporate in the future, the University of Alicante decided to develop the last year of the Degree in Multimedia Engineering through a project-based learning methodology in work teams. Students develop the learning activities within a university framework that simulates a work environment. The objective of this research is to know how the teams work and the difficulties that the students find in the development of the projects. To carry out the projects, the students form teams with an indeterminate number of members, since they are given the freedom to group according to their preferences. The sample of this research was made up of 59 students enrolled in the last year of Multimedia Engineering. To know the organization of the groups, the students were surveyed using an anonymous questionnaire on the degree of personal satisfaction related to issues about the functioning of the teams. The questionnaires were administered through the Moodle platform at the end of the academic year. Students responded to questions through a Likert scale (1 strongly disagree-5 strongly agree). From the answers provided by the students, it has been verified that most students evaluated the functioning of their groups in a positive way. However, it is noteworthy that in many cases the students in a group know each other in advance because of the freedom to make up the teams. This aspect influences the good functioning of the teams and it is important to emphasize that, in an actual work environment, people joining work teams seldom has the possibility of choosing who they want to work with. Despite the fact that the students' choices in the formation of the work teams were free, it should be noted that there were some negative opinions: 12% of the students negatively perceived a member of the group by barely letting others intervene, 14% were dissatisfied with the assumed role, 19% reported lack of motivation, 20% considered that the group size was inadequate, 24% perceived ineffectiveness, 27% detected a lack of participation by all members, 22% reported the lack of a leader and up to 50% considered that they had a bad organization in the group, with the consequent wasted time.

**Keywords:** *Project-based learning, teamwork, generic skills, difficulties.*

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### 1. Introduction

The rapid evolution of today's society is increasingly demanding new skills for professionals. These professionals of the future, among other skills, need to collaborate and cooperate with each other and work in multidisciplinary and multicultural environments. In this context, it is essential to develop teamwork skills.

The educational community rethinks each day how to approach training to respond to these needs. From our point of view, one of the teaching methods that best adapts to these requirements is Project Based Learning (PBL) since it allows covering the key aspects of which we have spoken, with a professional project as an objective, that includes an active, cooperative and interdisciplinary role of the student.

The Degree in Multimedia Engineering at the University of Alicante has as its main objective to train Information and Communication Technologies (ICT) professionals to be able to lead the new projects in the field of Multimedia, both about leisure and digital entertainment as in the management of content for dissemination in information networks. The fourth course of this engineering is designed following the principles of PBL, among several subjects and using a multimedia application as a project,

with adequate complexity and an interesting motivating character. In this way, this final course effectively simulates the professional practice of future engineers in the development of complex projects. The project that the students must develop is unique for all course subjects and its objective is to serve as the first professional work to include in the students' personal portfolio (Villagr -Arnedo et al., 2014).

One of the main ways to incorporate teamwork skills in this fourth year is to develop the projects in team. These work teams have a variable number of components and students are free to configure them. In this context, we ask ourselves what difficulties students encounter when they work in teams. This research focuses on determining these difficulties through a questionnaire that includes issues such as the organization of the group, the role of each component of the team or the degree of motivation achieved, among others.

## 2. Objective

The objective of this research is to know, from the simulation of a professional environment within the university, the difficulties that the students encounter in the development of their projects related to the operation of the work teams, and to detect the training needs in generic competences in relation to the social skills they require.

## 3. Methods

### 3.1. Participants

The sample consisted of 59 students enrolled in the last year of the Degree of Multimedia Engineering of the University of Alicante. The ages of the participants ranged from 20 to 32 years, with the mean age of the sample being 22.3 years. As for the gender of the sample, 72.7% were men and 27.3% were women.

### 3.2. Instruments

To know the organization and performance of the groups, the students were asked, through an anonymous questionnaire (Table 1), on the degree of personal satisfaction related to issues related to the management of their groups. Students responded to questions in a Likert scale (1 strongly disagree-5 strongly agree).

*Table 1. Questionnaire answered by the students about the functioning of the groups.*

|  |
|--|
| <p><b>Indicate, on a scale from 1 to 5, your degree according to the following statements:</b><br/> <i>1- Totally disagree; 2- Disagree; 3- Neither agree nor disagree; 4- Agree; 5- Totally agree</i></p> <ol style="list-style-type: none"> <li>1. I am satisfied with the work done by the group</li> <li>2. I have been motivated working within the group</li> <li>3. The number of people who make up my group is adequate</li> <li>4. The role I have assumed within the group is adequate</li> <li>5. The group's work has been effective in achieving the stated objectives</li> <li>6. All members of the group have actively participated almost all the time</li> <li>7. One or a few members of the group have taken too much of the work and have barely allowed others to intervene</li> <li>8. One or a few members of the group have barely intervened</li> <li>9. We have lacked order, and finding a method of work that helps us to take advantage of the time</li> <li>10. It has been lacking someone who leads the group, we have lacked to designate a coordinator or a secretary</li> </ol> |
|--|

### 3.3. Procedure

To carry out this research, teams were formed with an indeterminate number of members who were free to group according to their preferences. The cases that the students were not able to form a group, the teacher intervened helping them.

Once all the students were grouped, a different project was assigned to each group. The workload of each project was based on the number of members that formed the team. The groups were autonomously managing their work and the internal organization of the team; only when hard difficulties arose and the students did not know how to face them, the teacher intervened at the request of the students.

At the end of the academic year and after the execution of the projects, we proceeded to evaluate the difficulties in the organization and functioning of the groups during the elaboration of the projects assigned in the course. In order to evaluate such organization and functioning, an individual questionnaire was administered through the Moodle platform in which each student was asked to respond anonymously to the questions.

#### 4. Results

The answers given by the students to the administered questionnaire show that most of the components of the groups were satisfied or very satisfied in relation to the satisfaction of the work done by the group, compared to 17% who showed little or no satisfaction.

Regarding the level of motivation that each student had to develop their work within the team, the answer was high or very high in more than 50% of the individuals, however almost 19% of the students were not very motivated or not motivated at all when working with the group.

Regarding the number of people who formed the working group, despite being free to choose its composition, 20% think that the number of components of the team was not adequate, compared to 67% who are satisfied with the size of the team.

To the question of whether they considered that the role they had assumed within the group was adequate, the vast majority of them agreed or totally agreed and only 14% disagreed or totally disagreed.

In relation to the effectiveness of the group work perceived by the students to achieve the objectives of the project, the percentage of subjects who disagreed or totally disagreed is 24%, being this case a 50% of the students who considered the group effectiveness as positive.

Of the total number of individuals responding to the questionnaire, slightly more than half considered that all members of the group participated actively almost all the time, and 27% of those disagreed or totally disagreed with this statement.

The percentage of subjects who perceives a member of the group in a negative way because they have overtaken the work and barely let other members of the team intervene is very reduced, with a value of 12%. A large majority consider that no teammate has acted to make difficult the intervention of his or her mates. However, the negative perception of some members of the team who have intervened little is twice as many individuals: 24% think that some members of the group have barely intervened.

In relation to the organization of the group, half of the students (50%) think that they have lacked order, and finding a method of work that helps them to take advantage of the time. 22% of the students consider that they had lacked to designate a coordinator or a secretary who will be in charge of running the group.

All the answers are summarized in Table 2.

Table 2. Answers of the students to each question of the survey. Percentage of students.

| Questions   | 1    | 2    | 3    | 4    | 5    |
|---|------|------|------|------|------|
| I am satisfied with the work done by the group  | 6,9  | 10,3 | 17,2 | 36,2 | 29,3 |
| I have been motivated working within the group  | 12,1 | 6,9  | 22,4 | 32,8 | 25,9 |
| The number of people in my group is adequate  | 10,3 | 10,3 | 12,1 | 36,2 | 31   |
| The role I have assumed within the group is adequate  | 6,9  | 6,9  | 8,6  | 43,1 | 34,5 |
| The group's work has been effective in achieving the stated objectives  | 10,3 | 13,8 | 24,1 | 22,4 | 29,3 |
| All members of the group have actively participated almost all the time                                       | 15,5 | 12,1 | 19   | 20,7 | 32,8 |
| One or a few members of the group have taken too much of the work and have barely allowed others to intervene | 56,9 | 20,7 | 10,3 | 6,9  | 5,2  |
| One or a few members of the group have barely intervened  | 43,1 | 17,2 | 15,5 | 8,6  | 15,5 |
| We have lacked order, and finding a method of work that helps us to take advantage of the time                | 20,7 | 10,3 | 19   | 31   | 19   |
| It has been lacking someone who leads the group, we have lacked to designate a coordinator or a secretary     | 39,7 | 22,4 | 15,5 | 15,5 | 6,9  |

1- Totally disagree

2- Disagree

3- Neither agree nor disagree

4- Agree

5- Totally agree

## 5. Discussion and Conclusions

Although the majority of the students evaluated in a positive way the functioning of their groups, it should be noted that they know each other since the beginning of their studies and when it comes to teamwork they are free to choose who they want to work with. This aspect must be highlighted since in the companies each person who joins a human team has no possibility to choose with whom to work. Despite this fact, it should be noted that the negative evaluations ranged from the low percentage of subjects who perceived a member of the group negatively due to having overtaken the work and barely let the other intervene (12%), to the worst opinion being the perception that not all the members of the group participated actively almost all the time (with 27%).

Other researches carried out by the authors (Pertegal, Castejón and Jimeno, 2010, 2014) show lack of students in generic competences of socio-emotional nature such as interpersonal intelligence necessary to interact with other people, according to experts and professionals. High levels of these competencies contribute to the good functioning of the subjects in the workplace (Boyatzis, 2008, Brotheridge and Lee, 2008, Cooper, 1997, Dreyfus, 2008, Koman and Wolff 2008).

Possible future lines of research could be aimed at developing this type of skills in students. Moreover, if we consider that men and women have different levels of emotional competence (Sánchez, Fernández-Berrocal, Montañés, Latorre, 2008), it may be advisable to delve into difficulties in the functioning of groups in function of the genre in order to design and implement improvement programs for the socio-emotional competencies.

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## EMOTIONAL COMPETENCES AND SOCIAL SKILLS FOR TEACHING IN HIGHER EDUCATION

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### Abstract

Within the field of education, the influence of social and emotional aspects in the teaching-learning process is increasingly evident. The interactions that occur between professors and students are marked by the social and emotional skills they possess. In the case of the professors, they act as a socializing agent for the students, so their actions play a fundamental role in establishing optimal interaction conditions.

In this article we present a series of shared reflections by a team of higher education professors from the University of Huelva (Spain) in relation to the development and acquisition of the social and emotional skills necessary for an adequate teaching exercise, based on their experiences.

Specifically, this paper aims to analyze what should be the emotional competences and social skills that can enable a university professor to mediate and lead the teaching-learning processes that are established in Spanish universities classrooms in the present.

In this way, we have performed an analysis throughout the teaching exercise. The initial period is usually characterized by lack of experience, feelings of frustration and restlessness. As the professional trajectory progresses, the approach of different questions arises as well as the search for educational responses generating a series of guidelines that consolidate over time and which show the main social and emotional skills for teaching in higher education.

Based on the experience presented and the literature review carried out, it is evident the importance of emotional competences and social skills for the teaching-learning process, in which university professors participate, as well as the need to develop training programs for teachers, providing them with the necessary emotional and social skills.

**Keywords:** *Emotional Competences, Social Skills, Teaching, Higher Education.*

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### 1. Introduction

Within the field of education, the influence of social and emotional aspects in the teaching-learning process is increasingly evident. The interactions that occur between professors and students are marked by the social and emotional skills they possess. In the case of the professors, they act as a socializing agent for the students, so their actions play a fundamental role in establishing optimal interaction conditions.

In this article we present a series of reflections that arise from multiple experiences lived from and for teaching in any of its modalities. As a result of the stumbles and successes, we start from these reflections of the teacher at the crossroads. Going back to the beginnings of the teaching profession, it is worth mentioning that the more novices we are in teaching, the more security we need, that is to say, we need to follow sequential and fixed processes, due to our fear of uncertainty and improvisation, for this reason we speak of the teacher at the crossroads. Teaching itself is a process in which we must learn to make decisions in the face of the variability of situations that we can find, since the university career is nothing more than a way of making decisions. Analyzing this situation, we find that the insecurities and contradictions are valid and positive if we learn to coexist with them, both in professional and personal life, as they give us the opportunity to grow in every way.

Below we expose a series of shared reflections by a team of higher education professors from the University of Huelva (Spain) in relation to the development and acquisition of the social and emotional skills necessary for an adequate teaching exercise, based on their experiences.

## **2. Objectives**

This paper aims to analyze what should be the emotional competences and social skills that can enable a university professor to mediate and lead the teaching-learning processes that are established in Spanish universities classrooms in the present.

## **3. Methods**

We have performed an analysis throughout the teaching exercise based on the experience gained by five professors in the areas of Education and, Social and Educational Psychology at the University of Huelva, Spain, with an experience between four and more than twenty years of teaching.

The method is based on a discussion group carried out at the Faculty of Education (University of Huelva), during the course 2016/2017.

## **4. Results and discussion**

The results present social skills and emotional competences that were analyzed as appropriate for an adequate teaching exercise in Higher Education, based on the results of the discussion group carried out, in which five professors from the University of Huelva participated.

### **4.1. How to be sensitive to diversity**

A basic and fundamental skill of university professors is to see diversity, taking into account the variability interpersonal, intrapersonal variability as. We understand the first as what activates you, what motivates you, what someone else may not care as much as yourself. In this sense, what serves a student does not have to serve another student. On the other hand, the intrapersonal variability are those changes that we experience internally, which makes that the same person can motivate or demotivate something, depending on the time. In this same line, cognition, action and emotion are essential aspects to consider in intrapersonal variability. We will always remember the day before the appearance of some media phenomenon and the day after our first love break. However, these two sources of variability are not fixed, but the very people we work with have external variables that at the same time differentiate us from other people, and these also influence our personal state. According to Alonso & Varela (2017) the education system must train teachers to deal successfully with the complexities and challenges of diversity.

### **4.2. Interactive networks and collaborative learning**

Working in heterogeneous groups enrich us, we must establish synergies. Working in an interactive network is beneficial; it can contribute and receive from several points of view. It is a matter of apprehending from a multidisciplinary approach in which production both qualitatively and quantitatively is much greater. When we have to negotiate content, we tend to think that the conflict is negative. The conflict is positive, when different variables are presented as long as none of them are imposed and a good resolution can be reached.

Collaborative learning offers opportunities for the construction of knowledge by sharing, questioning, and justifying ideas and understanding (Chi, 2009). Effective collaborative learning requires groups to set goals and standards together (Näykki, Järvenoja, Järvelä, & Kirschner, 2017).

### **4.3. Stress management or burnout**

From its beginnings, teaching has been one of the professions most exposed to the study of their working conditions and the repercussions that this has on their workers. In particular, numerous studies such as those of Kyriacou, 2001; Moriarty et al., 2001; Troman, 2000 or Woods and Carlyle, 2002, have investigated the working conditions of the teaching profession and its physical and mental effects.

Many of these studies have focused on concepts such as professional stress or burnout, a syndrome that seems to arise as a result of a continued response to work stress and that can affect the physical and mental health and social relationships of teachers who suffer (Grau, Suñer and García, 2005; Montgomery and Rupp, 2005; Taris et al., 2001; Topa and Morales, 2005).

The personal resources and emotional variables of the teacher play an important role in their level of work stress. Among the factors that may imply an enormous potential for workplace stress, we would like to emphasize the pressure or temporal limitation (Briese-Neumann, 1997; Conte, Landy and Mathieu, 1995; Conte, Mathieu and Landy, 1998; Gracia, Peiró and Ramos, 1996; Karna and Kelly, 1992, Knauth, 1993, 1996; Landy et al., 1991; Macan, 1994; McGrath and Kelly, 1986). Thus, we agree with other studies such as Karasek (1979), in which the control of working time can be a primordial aspect to avoid burned worker syndrome or burnout.

Another alternative, more current, would be the engagement that emerges as the cognitive-affective state that, linked to the development of emotional skills and emotional intelligence, serves the teaching staff as a coping strategy for work stress (Peñalva, López-Goñi and Barrientos, 2017). Thus, structured and explicit emotional education is a form of non-specific primary prevention (Bisquerra, 2005), which allows the acquisition of stress management skills, as well as the acquisition of skills for teaching (Peñalva et al., 2013).

#### **4.4. Teaching self-concept and self-esteem**

Self-concept is the image we have of ourselves, while self-esteem is the valuation we personally make of our self-concept or, in other words, it is the value that a person attributes to himself. This perception and self-assessment, in the case of teachers, condition their psychological balance, their relationship with others, such as students, and their professional performance (Hugo, 2012). Self-esteem is related to the feeling of dignity, that is, to the person's awareness of his or her own worth. Therefore, it is not surprising that the positive consideration of self promotes self-actualization and a good teaching exercise (Cervino, 2008). Thus, a positive self-esteem is not only important, but also necessary, for an adequate process of professional growth.

Self-concept, in the academic field, is the person's perception of his or her worth as a teacher. This is formed from the experiences, comments and supports he receives from people in his environment. At the same time, academic self-concept influences performance and vice versa, it means that if the teacher relies on their skills will strive to achieve good results and those good results, in the learning of their students, will contribute to strengthen their image as a good teacher.

According to Franco Voli (1998), professors must accept and assume in their own experiential and professional dynamics, that self-esteem can be learned and each person is able to do it. That is, the professor is responsible for building his own self-esteem, this is not immutable, what is more, it can be transformed. On the other hand, following the same author, quoted in Hugo (2012), each professor projects and transmits the psychic situation in which he finds, to his students and this is important because they see him as a "model". It is necessary to be aware, during his teaching exercise, that he's projecting traits of his personality. This reality is given in a conscious or unconscious way, so it is necessary to know how to recognize it, because in his decisions, attitudes, reflections, etc., the teacher conveys his value and appreciation. Finally, society also understands that the teacher has the responsibility of forming the personality of his students, that is, his moral personality is required as the subject of other subjects personality formation.

### **5. Conclusions**

Based on the experience presented and the literature review carried out, it is evident the importance of emotional competences and social skills for the teaching-learning process, in which university professors participate, as well as the need to develop training programs for teachers, providing them with the necessary emotional and social skills.

The initial period is usually characterized by lack of experience, feelings of frustration and restlessness. As the professional trajectory progresses, the approach of different questions arises as well as the search for educational responses generating a series of guidelines that consolidate over time and which show the main social and emotional skills for teaching in higher education.

As we have discussed, when we teach, it is necessary to see the diversity of our students in order to offer them an educational response tailored to individual needs.

On the other hand, in the teaching and learning process, it is beneficial to create interactive networks and to develop collaborative activities in which students feel the protagonists of their own learning.

In relation to work stress, we agree with the study carried out by Cladellas and Badía (2010), the possibilities of university teachers to manage their work time, and thus to be able to combine their work and family life, or simply to plan their leisure time, is important for the prevention of diseases associated with health and especially the stress. We also understand that training programs in emotional skills and emotional intelligence are increasingly needed to improve the health and well-being of teachers. In this line, more and more studies support the relationship between these factors, betting on training in emotional intelligence as a tool against burnout (Peñalva, López-Goñi and Barrientos, 2017).

For their part, self-esteem and self-concept are very important aspects that must be taken into account in the academic field. On the one hand, the teacher himself must know that his personality is built from very complex aspects that determine him as a person and in his role as teacher and that give shape to his self-concept. On the other, the influence of their own self-concept in their professional practice, will determine the construction of their self-esteem. The good teacher must make his self-esteem and self-concept part of his professional being, projecting in his work, and from his personality, essential aspects of a quality education (Hugo, 2012).

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# MEASURING INFORMATION AND COMMUNICATION TECHNOLOGIES FOR EDUCATIONAL POLICY IMPROVEMENT: EDUCATION INFORMATIZATION INDEX

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## Abstract

The extent by which a geographical area, an economy or a society is becoming information-based, i.e., increase in size of its information labor force, is referred to as informatization. How can we know what our position is in the process of global informatization? What development strategies should be taken? To reap the benefits of the rapidly changing information society, governments need to monitor and benchmark progress based on measurable indicators with a view to designing and reviewing national policies and strategies. On the other hand, the principles and government policy-making in the educational sphere, as well as the collection of laws and rules that govern the operation of education systems are educational policy. Seeing the informatization as a measure of the educational policy and starting from the available indicators in the World Economic Forum's Global Information Technology Report (GITR), we follow the methodology for calculation of the Chinese National Informatization Index Quantity (NIQ) to propose an informatization level assessment framework and introduce a composite indicator – Education Informatization Index (EII). Although it is made up of only two main categories (Educational Policy Implementation subindex and Educational Policy Creation subindex) and a total of six individual indicators, it captures well all the socio-political flows in the educational sphere in the Republic of Macedonia in the past five-year period (2012-2016). The Education Informatization Index (EII) is calculated as a weighted sum, and weights of subindexes and indicators are assigned by applying the Rank-Order Centroid method. As the selection of indicators is often the result of a process of trade-offs and negotiations among stakeholders, national respondents and international experts (one group of countries may perceive certain indicators as very policy-relevant and unproblematic, while other countries may judge the same indicators as irrelevant or too complex), there still remain some open questions about the number of subindexes, the number of aggregation levels, the number of indicators, methods for weight assignment, feasibility for collecting reliable data, and international comparability. Having in mind that policymakers can review progress of the country over time in comparison with their nationally defined targets and other relevant reference countries, the presented methodology and the results can help them in making informed decisions or in demonstrating greater commitment to integrating ICT into the education system. The ICT utilization in education should be promoted effectively, in line with the policy aiming to create a learning system and schools suitable for the 21st century.

**Keywords:** *Informatization, educational policy, composite indicators, Education Informatization Index.*

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## 1. Introduction

Informatization refers to the degree by which an area, an economy, or a society as a whole, is becoming information-based, i.e., "enlargement of its information labor force" (Russell & Cohn, 2012), whereas educational policy encompasses all the principles and policy-making in the educational domain, as well as the set of laws and rules that manage the operation of education systems (Bell & Stevenson, 2006). Policy-making, in general, is an interdisciplinary activity that incorporates transformation of political decisions into real solutions that are implemented in the society. One of the crucial phases in the development of a new policy, or adjusting an existing one, is the process of adaptation and/or alteration of the legal framework on which the policy is implemented. Bringing about new legislation, or analyzing an existing one, should have one single starting point: effective address to the problems of a certain area for both the directly involved, and for the society as a whole. To achieve this goal, it is necessary to perform

a comprehensive and detailed analysis, including internal and external circumstances of the problem being treated, to find regulatory and/or non-regulatory solutions, to make analysis of the parties involved, and most importantly, to determine the most favorable decision in terms of the economic justification for the decision (Fischer *et al.*, 2007). The educational policy analysis, in particular, tries to find answers to the questions about the purpose of education, the goals (both societal and/or personal) that it is designed to accomplish, the methods for achieving them, and the tools for quantifying their success or failure.

As national and local governments in developing countries work to implement policies and programs for integrating Information and Communication Technologies (ICTs) in education, a greater need has developed for assessing and evaluating how effective, efficient and transformative these technologies are in education (The Berkman Center for Internet & Society, 2005). Existing ICT policies should be revised to guarantee that they stimulate effective use of technology through the program of study, as well as support wider educational reforms.

All the countries require a nationally unified informatization level evaluation index system that captures well the situation in the country, on one hand, and interrelates with the international community, on the other. Among the issues is whether “informatization” can be measureable opposite to the tangible products of industrialization, for example. Taylor and Zhang (2007) addressed the issues behind the boundaries of current theoretical models with regard to quantifying the “positive impacts of ICT projects”. Many international organizations, such as the United Nations’ World Summit on the Information Society (WSIS), the International Telecommunication Union (ITU), as well as the Organization for Economic Co-operation and Development (OECD) also identified this necessity and have placed initiatives to improve the methodologies for “measuring an information society” (UNESCO Institute for Statistics, 2009).

The remainder of this paper is organized as follows. Section 2 focuses on related work and identifies the main motivations. It addresses some important initiatives for measurement of the level of informatization as an ongoing area of development: the *World Economic Forum’s Networked Readiness Index (NRI)*, the *Global Networked Readiness for Education of the Berkman’s Center for Internet & Society* at Harvard Law School and the *Chinese Framework of National Informatization Indices*. But, how can we know what our position is in the process of global informatization? What development strategies should be taken? In Section 3 we introduce our proprietary informatization level assessment framework, i.e. the Education Informatization Index (EII), and discuss its development procedure, weights designation and principal findings. Finally, Section 4 concludes the paper.

## 2. Motivation and related work

The World Economic Forum’s Networked Readiness Index (NRI), also referred to as Technology Readiness, measures the predisposition of countries to take the advantage of the opportunities offered by information and communication technologies (ICTs). It is published as part of their annual Global Information Technology Report (GITR) (World Economic Forum, 2016), which is considered “the most authoritative and comprehensive assessment of how ICT impacts the competitiveness and well-being of nations”.

Similarly, in an effort to address some of the shortcomings of monitoring, evaluation, and data collection, and to provide insight for policymakers, the ICT for Education Program of the World Bank Institute and the Berkman Center for Internet & Society at Harvard Law School, with the support of the Education Development Center, launched a pilot research project in 2003 –Global Networked Readiness for Education, to directly solicit user experiences of ICTs in developing world schools. Eleven developing countries including Brazil, Costa Rica, El Salvador, the Gambia, India (state of Karnataka), Jordan, Mexico, Panama, the Philippines, South Africa, and Uganda participated in the study, selected on the basis of a combination of characteristics including geography (three African, one Middle Eastern, two Asian and four Latin American nations), income, language, population, ICT-education activity at the secondary education level, and presence of on-the-ground contacts.

East Asian countries (i.e. Republic of Korea, 2013; Kim & Lee, 2011) and China (Chen *et al.*, 2006), in particular) have worked on establishing a Framework of National Informatization Indices (Deng *et al.*, 2003), which consists of six aspects: 1) Information resources, 2) National information network, 3) Application of information technologies, 4) Information technologies and industry, 5) Informatization talents, and 6) Policies, regulations and standards. They even propose a methodology for measurement and calculation of National Informatization Index Quantity (NIQ) (Xu, 2004) in order to conclude, for example, that “China’s NIQ in 2000 was 38.46, and the average NIQ growth from 1998 to 2000 was

21.9%”. Zhang (2015) applies the Grey forecasting model from Grey theory to forecast precisely the informatization index of China and other countries from 2013 to 2020 and makes comparison among them. The findings provide a valuable starting point for governments in drafting relevant informatization policies.

### 3. Informatization level assessment framework: Education Informatization Index (EII)

Starting from the available indicators in the World Economic Forum’s Global Information Technology Report, and by following the methodology for calculation of the Chinese National Informatization Index Quantity, we propose a measure of the education informatization level in the Republic of Macedonia.

#### 3.1. Development procedure and weight designation

Having in mind that the problem is observed through the prism of the educational policy and its two complementary aspects – a) creation and b) implementation, we introduce the Education Informatization Index (EII) as a composite indicator made up of 2 (two) main categories (subindexes) and 3 (three) individual indicators in each of them, rank-ordered in descending order:

- 1. Educational Policy Implementation subindex (weight  $w_1$ )
  - 1. Quality of Educational System (normalized value  $p_{11}$ , weight  $w_{11}$ )
  - 2. Availability of latest technologies (normalized value  $p_{12}$ , weight  $w_{12}$ )
  - 3. Internet access in schools (normalized value  $p_{13}$ , weight  $w_{13}$ )
- 2. Educational Policy Creation subindex (weight  $w_2$ )
  - 1. Effectiveness of law-making bodies (normalized value  $p_{21}$ , weight  $w_{21}$ )
  - 2. Government success in ICT promotion (normalized value  $p_{22}$ , weight  $w_{22}$ )
  - 3. Importance of ICTs to government vision (normalized value  $p_{23}$ , weight  $w_{23}$ )

Consequently, the Education Informatization Index (EII) can be calculated as a weighted sum by the formula:

$$EII_{MK} = \sum_{i=1}^2 \left( \sum_{j=1}^3 P_{ij} W_{ij} \right) * W_i$$

where:

- 2 is the number of subindexes,
- $w_i$  is the weight of subindex  $i$ ,
- 3 is the number of indicators for subindex  $i$ ,
- $w_{ij}$  is the weight of indicator  $j$  of subindex  $i$ ,
- $p_{ij}$  is the normalized value of indicator  $j$  of subindex  $i$ .

By applying the Rank-Order Centroid method, the subindexes and the indicators are listed in order from most important to least important, and the following formulas are used for assigning weights:

$$w_1 = \frac{\left(\frac{1}{1} + \frac{1}{2}\right)}{2} = 0,75 \quad w_2 = \frac{\left(\frac{1}{2}\right)}{2} = 0,25$$

$$w_{11} = w_{21} = \frac{\left(\frac{1}{1} + \frac{1}{2} + \frac{1}{3}\right)}{3} = 0,61 \quad w_{12} = w_{22} = \frac{\left(\frac{1}{2} + \frac{1}{3}\right)}{3} = 0,28 \quad w_{13} = w_{23} = \frac{\left(\frac{1}{3}\right)}{3} = 0,11$$

#### 3.2. Principal findings

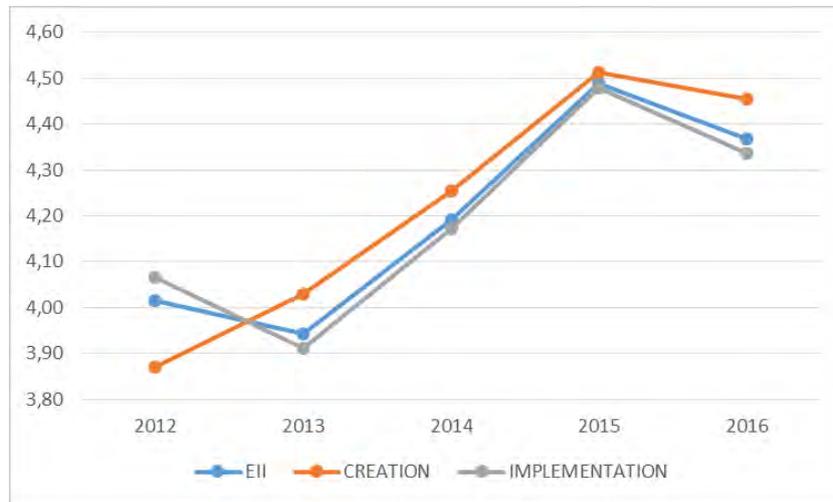
From Table 1 and Fig. 1, a slight decline of the value of the Education Informatization Index (EII) can be observed in 2013 in comparison to 2012 (3.94 vs. 4.02), and in 2016 in comparison to 2015 (4.37 vs. 4.39). At the lower level of aggregation, one can conclude that only the value of the implementation subindex suffered in the first case, whereas in the latter, the value of the creation subindex suffered, as well. Namely, in 2013, only the indicators that refer to the “Availability of latest technologies” and the “Quality of educational system” had lower values in comparison to 2012. Yet, in 2016, almost all the indicators comprising both the complementary aspects of the educational policy have deteriorated: “Importance of ICTs to government vision”, “Government success in ICT promotion” and “Effectiveness of law-making bodies” (on the creation side), as well as the “Internet access in schools” and the “Quality of Educational System” (on the educational policy implementation side).

Even though the Education Informatization Index is a composite indicator made up of only 2 (two) main categories (subindexes) and a total of 6 (six) individual indicators, from the point of view of verification and validation, the proposed informatization level assessment framework captures well all the socio-political flows in the sphere of educational policy creation and implementation in the Republic of Macedonia in the past five-year period (2012-2016).

Table 1. Education Informatization Index (EII).

| Weight $w_i$    | EDUCATIONAL POLICY CREATION             |                                     |                                    | EDUCATIONAL POLICY IMPLEMENTATION |                                     |                               | EII  |
|-----------------|---|-------------------------------------|------------------------------------|-----------------------------------|-------------------------------------|-------------------------------|------|
|                 | 0.25                                    |                                     |                                    | 0.75                              |                                     |                               |      |
|                 | Importance of ICTs to government vision | Government success in ICT promotion | Effectiveness of law-making bodies | Internet access in schools        | Availability of latest technologies | Quality of Educational System |      |
| Weight $w_{ij}$ | 0.11                                    | 0.28                                | 0.61                               | 0.11                              | 0.28                                | 0.61                          |      |
| 2012            | 3.88                                    | 4.97                                | 3.36                               | 4.79                              | 4.62                                | 3.63                          | 4.02 |
| 2013            | 4.12                                    | 4.97                                | 3.58                               | 4.84                              | 4.56                                | 3.37                          | 3.94 |
| 2014            | 4.59                                    | 4.92                                | 3.89                               | 5.06                              | 4.74                                | 3.66                          | 4.19 |
| 2015            | 4.88                                    | 5.00                                | 4.22                               | 5.46                              | 4.86                                | 3.96                          | 4.49 |
| 2016            | 4.82                                    | 4.88                                | 4.20                               | 5.18                              | 5.04                                | 3.82                          | 4.37 |

Figure 1. The Education Informatization Index (EII) and its subindexes.



#### 4. Conclusions and educational policy implications

As the selection of indicators is often the result of a process of debates and compromises among stakeholders, i.e. national participants and international experts (a group of countries may identify certain indicators as very policy-relevant and straightforward, while other countries may find the same indicators as irrelevant and/or intricate), there still remain some open questions about the number of subindexes, the number of aggregation levels, the number of indicators, methods for weight assignment, feasibility for collecting reliable data, and international comparability.

Having in mind that policymakers can assess the improvement of the country over time in comparison with their nationally defined targets, the presented methodology and the results can aid in making knowledgeable decisions or in establishing greater commitment to incorporating ICT into the education system. It is important to endorse the use of ICT in education systematically in a strategic manner, from the aspects of software, hardware, and personnel. The ICT use in education should be supported effectively, in line with the policy targeting to create a learning system and schools appropriate for the 21st century. In this process, many related parties in a number of fields should be involved, above and beyond experts in the fields of ICT and education.

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## A NEW U.S. HIGH SCHOOL RANKING SYSTEM WHICH COMBINES STUDENT PERFORMANCE AND COLLEGE MATRICULATION

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### Abstract

This study aims to find a new indicator to compare or rank US secondary schools. Firstly, most currently existing rankings are only applicable to a specific type of institution, such as private or public. Collecting different school systems together in any existing ranking system does not give any meaningful guidance. Secondly, most current ranking systems, especially when college matriculation is considered, neglect the initial academic competitiveness in the student pool of each school. To resolve the above drawbacks, this study has reviewed and compared the most popular existing ranking systems for US high schools, and discussed their advantages and drawbacks. Using an analysis of the results, a novel ranking index and model is proposed. The new proposed ranking model finds a common base applicable to all types of secondary schools. Not only does it take consideration of college matriculation rate, but also includes a competitiveness or performance index in each school, thus the new method has eliminated the bias resulting from different school size, student performance, student selectiveness and sector (private or public). This converged method applies uniformly to all schools and becomes a practical indicator to help parents and student in making enrollment decisions. To conclude, a sample of selected competitive US high schools ranked and compared using different ranking methods is presented, which reflects the unique aspects of this new proposed method over others.

*Keywords: Ranking, matriculations, US high School, national merit semifinalists.*

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### 1. Introduction

There is an increasing need for a fair and objective ranking for US high schools for both academic and commercial purposes, especially for those who may not be familiar with US secondary school system. Unlike how international or US colleges are frequently studied, analyzed, and compared, studies on US high school rankings have been limited. According to the US Department of Education, there are 26,407 public secondary schools and 10,693 private secondary schools in the United States. The comparison between these US secondary schools is made more difficult by the large number of types of school, and just like college rankings, they are often subdivided into specific categories. For instance, schools may be public or private, boarding or day, exam or non-exam, single-sex or co-ed, to name a few. Almost all current rankings have avoided comparing different types of schools, as there is no acceptable common index or standard that can effectively do so.

The most popular among all US high schools rankings include America's Top High Schools by Newsweek, the U.S. Best High Schools Rankings by U.S. News and World Report, Best Public & Private High Schools in America by Niche. Other organizations publishing rankings include Forbes and PrepReview. Just like with college ranking, a survey is one of the most frequently used tools to conduct a high school ranking. The data used includes standardized test scores like average SAT scores, college matriculations, teacher student ratio, class size, teachers' degrees, facilities, activities and even endowment. Even if each data point is an objective fact, the weight placed on each item can be subjective. For instance, someone who prefers small classrooms may place a heavy weight on teacher student ratio, while others may view other points such as teachers' qualifications to be more important. Different weights results in different rankings.

Among this range of different ranking factors, student performance and college readiness or matriculation are often the two most important. In fact, the rankings that have most attempted to maintain objectivity use measures of quality such as average SAT scores and college matriculations. These figures are also often that which public audiences and studies are most interested in. When comparing between different types of schools, SAT and college matriculations are also helpful simply because of its relevance to almost all schools, no matter private or public or other. Many private schools, especially the most competitive ones, annually publish their matriculation data online to demonstrate the capabilities and qualifications of their students to attract more competitive applicants. Therefore these two measurements are likewise the two main data points used in this study.

Using SAT exclusively for school rankings is rare, but an average SAT scores are often included in consideration for many ranking systems by Niche, Business Insider, etc. However, despite these scores being widely used, they nevertheless still possess some limitations. SAT average is not sensitive enough to differentiate most similarly competitive schools. For instance, Business Insider listed the national top 48 schools having a narrow range of average SAT score between 2040 and 2220. SAT may be a good indicator to differentiate between schools with a large gap in quality, but cannot accurately compare schools within a small margin. As another example, Boston.com has been using the statewide MCAS test score to rank all public high schools in Massachusetts for many years. Similar as SAT, MCAS is almost useless for highly competitive schools. Ranking based off of the English Lit MCAS score for 10<sup>th</sup> grade in 2012, all 28 top schools had perfect 100 points, and are therefore tied in ranking for 1<sup>st</sup> place, while the top 50 schools all averaged either a 99 or 100. Based solely upon test scores, these 50 schools would be practically indistinguishable.

College matriculation rate is another popular metric to rank schools. Prep Review, founded by MIT IPC, uses matriculation as the sole index in its school ranking. Matriculations into the Ivy League (referring to eight elite US universities: Harvard, Princeton, Yale, Columbia, Brown, UPenn, Cornell and Dartmouth), HPYMS (briefs for Harvard, Princeton, Yale, MIT and Stanford) and even matriculation to Harvard alone are ranked. This ranking system has minimal bias as there is no subjective parameter used. Despite it is a very popular and strong ranking index, there are still some shortcomings for its exclusive use. For most public schools, because there are no entrance exams or selectivity the matriculation is generally far inferior to those in private schools. The top non-exam schools nationwide generally see a matriculation rate into the Ivies of 5-6%, compared to up to 30-40% for the top private schools. Using college matriculation statistics doesn't seem to effectively compare these two sectors of schools.

Given the recent trend of increased applications from international and domestic students for entry into US secondary schools, and the increased need for better understanding the difference between these schools, it is important to find a more useful and fair ranking system which overcomes the aforementioned shortcomings. This study aims to find a common base for and characterization of all schools, and offers a demonstration through ranking a list of sample schools.

## 2. Motivation of This Study

In this study, we try to reveal the important factors which existing ranking systems have mostly ignored. Our aim is to build a new ranking method based on unbiased data including both school performance and college matriculation. From school performance, we can measure how well the school itself is able to help its students to enter certain colleges. Our motivation to build this model and develop the corresponding ranking system is quite practical.

Firstly, we want to build an indicator that can combine both student performance and college matriculation; unlike for many countries where national college entrance exams are the only factor which decides college acceptance, there are many factors for US colleges to decide whether to accept a student. Thus it is important to know how different secondary schools can affect the matriculation rates of students with the same or similar academic background.

Secondly, it is desirable to have an indicator applicable to compare different types of secondary schools;

Thirdly, we wish to understand the underlying factors which exists in the U.S. school systems. We try to find how students equally academically capable can have very different chances statistically to be accepted into competitive colleges from different schools.

## 3. Data Collection

Our ranking model will collect the following three sets of data.

The SAT is one of most frequently used indices to measure student academic performance. Since the SAT is part of a college application requirement, the average SAT score can be a good indicator to

compare all types of schools. As we discussed before, SAT scores can be less helpful or less sensitive when comparing top US schools. Therefore, it is desirable to have an alternative index for the academic performance comparison especially for top schools.

Fortunately we have found just the one. In fact there are basically no cases where anyone has used it for ranking purposes. In U.S. secondary schools, almost all students from either public or private schools also take the PSAT or Preliminary SAT in their third year of schooling. Furthermore, the students with around top 4% of scores are named National Merit Semi Finalists (NMSFs). We use the number of NMSFs of a school as a new indicator. For national top 50 or 100 schools, NMSF number is an excellent index to measure the academic performance of a school. NMSFs as an index has the advantage of being very sensitive in differentiating between the most competitive schools. For instance, public high school in Massachusetts with the best academic performance is Lexington High School. In the class of 2015, there were 29 students given this award. The second greatest is Acton Boxborough Regional High School with 20 such students. Similarly, for private schools, in Massachusetts Phillips Academy had 25 NMSFs in the class of 2015 while the second best school is the Roxbury Latin School with 10 NMSFs.

College matriculation is the other metric which we collect. More specifically, we collect the placement number into the Ivy League which includes Harvard, Princeton, Yale, Columbia, Brown, UPenn, Dartmouth and Cornell. We also include placement data to MIT and Stanford. It is worth noting that most private schools publish matriculations while most public schools don't.

#### 4. The Ranking Model

The general formula of the proposed ranking model is as follows. First we define a few variables:

$\alpha$  : number of students matriculated into certain notable college, including the Ivy League, MIT and Stanford, or another set of top colleges

$\beta$  : school academic performance indicator, possibly the average SAT score or the number of students who are admitted into National Merit Semi Finalists.

$\alpha / \beta$  : college matriculation performance under the same academic performance base of the students of a school.

The variables  $\alpha$  and  $\beta$  are important indices which have been used to rank secondary schools. In countries like China, Israel, India, Brazil, Norway, Russia etc., entrance exam scores are the only measurement to be used in accepting college students. Thus the ranking by any of these two variables are often correlated.

In other countries, like the United States, although exam scores are still important, many other factors can also affect the ultimate college admission decision. Higher average exam scores do not always transfer into higher college acceptance rates.

$\alpha$  and  $\beta$  should be selected based the specific schools to rank. For instance, for top schools, we can use placement data to Harvard, or Ivy League with MIT and Stanford for  $\alpha$ , and NMSF number for  $\beta$ . To rank less competitive schools, we use matriculation data to a wider range of US colleges as  $\alpha$  and the SAT average as  $\beta$ .

We will demonstrate this system by using these indicators to evaluate a few of the top ranked high schools. Boston Latin School or BLS and Phillips Academy or PA are considered respectively one of the best public schools in Massachusetts and one of the best private schools in the nation by many ranking systems. BLS had 10 students designated National Merit Semi-Finalists in the class of 2015. Amazingly, for the same class of 2015, it sent 24 students to Harvard University. PA sent 13 students for that year though it had 25 students with NMSF title. The  $\alpha/\beta$  ratio for BLS is 2.4 (24/10) while 0.52 (13/25) for PA. Based on this metric, BLS has an unarguable advantage over one of the best private schools nationwide to send students to Harvard. By this index, BLS has over a 400% advantage.

Let us look at another pair of private schools, PA vs Noble and Greenough School, also called Nobles. Forbes ranks Phillips Academy as No. 1 in the nation while Nobles ranks as No. 18. Nobles has sent around nine students to Harvard each year for the past five years. Its class of 2015 had six students titled as NMSFs. It has indices  $\alpha = 9$  (Harvard matriculation) and  $\beta = 6$ . This ratio  $\alpha / \beta$  of 1.5 is still far better than the 0.52 from PA. It is worth noting that both PA and Nobles are referred to as Harvard feeder schools by many. If we refer  $\alpha$  as placement to the Ivy League plus MIT and Stanford, PA has  $\alpha$  as 99 (two years average matriculations) and 30.4 for Nobles. Thus the ratio  $\alpha / \beta$  for PA is 3.96 and for Nobles is 5.07. Nobles still has an advantage over PA.

Table 1. The proposed rankings compared with other rankings for US high schools.

| US Secondary Schools  | $\alpha / \beta$<br>Ranking* | $\alpha / \beta$<br>Ranking** | Business<br>Insider<br>Ranking | Forbes<br>Ranking | Harvard<br>Placement<br>Ranking | Ivy MIT<br>and<br>Stanford<br>Placement<br>Ranking |
|---|------------------------------|-------------------------------|--------------------------------|-------------------|---------------------------------|--|
| Boston Latin School (Mass Public)                                   | 100                          | 29                            |                                |                   |                                 |  |
| Middlesex School  | 60                           | 68                            | 8                              |                   |                                 | 12   |
| Noble and Greenough School  | 59                           | 40                            | 46                             | 18                | 9                               | 24   |
| Hotchkiss School,   | 53                           | 100                           | 9                              |                   |                                 | 23   |
| Winsor School   | 42                           | 24                            | 30                             | 10                | 2                               | 16   |
| Groton School   | 38                           | 38                            | 7                              | 15                | 8                               | 12   |
| Milton Academy  | 36                           | 31                            |                                | 16                | 12                              | 15   |
| Buckingham Browne & Nichols   | 31                           | 27                            | 19                             |                   | 14                              |  |
| Chapin School   | 28                           | 30                            | 33                             | 11                | 7                               | 4  |
| Belmont Hill School   | 27                           | 25                            |                                |                   | 6                               | 11   |
| Spence School   | 24                           | 49                            |                                | 9                 |                                 | 10   |
| Roxbury Latin School  | 24                           | 14                            | 13                             | 5                 | 1                               | 7  |
| Phillips Academy Andover  | 22                           | 31                            | 1                              | 3                 | 15                              | 11   |
| Choate Rosemary Hall  | 19                           | 40                            | 10                             |                   |                                 | 12   |
| Brearley School   | 21                           | 17                            |                                | 4                 | 3                               | 3  |
| Dalton School   | 18                           | 24                            | 39                             | 13                | 19                              | 5  |
| Rye County Day School   | 18                           | 18                            | 42                             |                   |                                 | 13   |
| Lexington High School (Mass Public)                                 | 18                           | 13                            |                                |                   |                                 |  |
| Lawrenceville School  | 16                           | 39                            | 5                              | 14                |                                 | 11   |
| Boston University Academy   | 16                           | 9                             |                                |                   |                                 |  |
| Collegiate School   | 15                           | 16                            | 20                             | 7                 | 5                               | 1  |
| Trinity School  | 12                           | 14                            |                                | 1                 | 4                               | 2  |
| Phillips Exeter Academy   | 11                           | 18                            | 2                              | 6                 | 18                              | 15   |
| Horace Mann   | 9                            | 16                            | 29                             | 2                 | 13                              | 6  |
| Harvard Westlake School   | 9                            | 14                            | 6                              | 12                |                                 | 24   |
| Thatcher School   | 9                            | 12                            |                                |                   |                                 | 14   |
| Hunter College High School (NY Public)                              | 9                            | 8                             |                                |                   |                                 |  |
| Cate School   | 8                            | 28                            |                                |                   |                                 | 14   |
| Acton Boxborough Regional High School (Mass Public)                 | 6                            | 5                             |                                |                   |                                 |  |
| Hopkins School  | 6                            | 22                            | 25                             | 19                |                                 |  |
| Commonwealth School   | 6                            | 6                             |                                |                   |                                 | 21   |
| Concord Academy   | 5                            | 19                            |                                |                   |                                 | 16   |
| Harker School   | 4                            | 14                            | 18                             |                   |                                 |  |
| Stuyesant High (NY Public)  | 4                            |                               |                                |                   |                                 |  |
| Thomas Jefferson High School for Science and Technology (VA Public) | 2                            | 5                             |                                |                   |                                 |  |

\*  $\alpha/\beta$  is Harvard placement number over NMSFs, all values are scaled proportionally with the highest scorer to be 100.

\*\*  $\alpha/\beta$  is Ivy, MIT and Stanford placement number over NMSFs and all values are scaled in the same way as above.

Most are regarded as top ranking schools by various ranking systems. Under the common base of using the number of national merit semifinalists (NMSFs) awards, these different types of schools can be now compared side by side. As we can see, NMSFs are a far more sensitive indicator to differentiate these schools, either private or public. The data in Table 1 also shows huge unbalances between schools where students with similar academic abilities have different chances in entering top colleges. For instance, the data confirms the differences between private schools and public schools. These differences even exist in similar public exam schools, like Boston Latin School and Thomas Jefferson High School for Science and Technologies (TJHSST) which is often ranked the No. 1 national public high school. Boston Latin School has 379 senior students in 2017 while TJHSST has 437. Boston Latin School usually has around 10 students awarded with NMSFs and TJHSST has a whopping 119 in the class 2017, but the Boston Latin School can send 20-30 students to Harvard every year while TJHSST had only 5 students in average between 2009 and 2013.

## 5. Conclusions

In this study, we show how schools can be ranked by combining the matriculation with student performance. This new ranking can be helpful in revealing the following facts.

- Our new ranking has revealed important facts that have not been discussed and used for school comparison;
- Our ranking may help to tell how a secondary school can affect the chance of a student with a given academic background to enter a particular group of colleges;
- It provides students additional measurements when selecting high schools or secondary schools to apply and attend;
- It provides a tool for various audiences to find extremely unbalanced admission criterion for students with similar academic qualifications.

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# WORKSHOPS





## ELEMENTS OF ACADEMIC WRITING STYLE

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### Abstract

First year composition (FYC) course requirements at universities worldwide create multitudinous hurdles for incoming freshman. Students are expected to pioneer writing assignments, analyze critically, adhere to strict formatting guidelines, include properly referenced scholarly sources, abide by enforced deadlines, and decipher complex grading schema – a daunting array of tasks indeed. In addition to the aforementioned challenges, a student desirous of success must absorb the subtle nuances of academic writing style.

This workshop is designed to engage both educators and students alike in an interactive lesson that aims to facilitate the development of academic writing style through narrated classroom activities, exercises and discussion.

*Keywords: Academic writing style.*

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### 1. Introduction

The presenter will provide definitions of academic writing style and identify common language deficiencies displayed by first year composition students. Participants will be guided through a demonstration lesson consisting of individual task completion, group oriented questioning and answering, and team work activities targeting weaknesses and developing strengths. The presenter will comment intermittently on academic rationale and teaching methodology. Lesson ideas involving the use of learning management systems, mobile phones and internet technology will be injected into the discussion.

### 2. Method

- Define academic style
- Scaffolding and diagnostics
- Individual work
- Group work
- Discussion

### 3. Discussion Points:

- Recommended avoidances/usages
- Formal language
- Passive voice vs. active voice
- To nominalize or not to nominalize
- Incorporation of technology

### 3. Objectives

- To define academic writing style
- To practice the language of academic writing style
- To offer lesson plan ideas
- To promote the use of technology in lesson plans

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## EMBEDDING RESEARCH EXPERIENCES INTO THE SCIENCE UNDERGRADUATE CURRICULUM

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### Abstract

The Life Sciences undergraduate curriculum at Canterbury Christ Church University is designed to provide students with opportunities to develop their profile as researchers who are industry-ready. We believe that the development of a ‘students as researchers’ ethos helps to enhance students’ employability; research helps to foster critical thinking and enhances students’ ability to become independent learners, while at the same time they can practice valuable subject specific knowledge. We have structured our programmes to create a series of opportunities throughout the whole student journey, so students can engage in research and research-like activities both as part of their taught curriculum, as well as beyond. Research and research-like activities are put at the centre of the curriculum, and students move from being recipients of knowledge to collaborators in its production. We call this approach “research-involved teaching”. The aim of this workshop is to share strategies to develop an undergraduate curriculum with a strong research focus.

**Keywords:** *Research-involved teaching, employability, students as researchers.*

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### 1. Introduction

Childs has defined undergraduate research as “student engagement from induction to graduation, individually and in groups, in research and inquiry into disciplinary, professional and community-based problems and issues, including involvement in knowledge exchange activities” (Childs, 2005). Research entails a complex interaction between theory and practice, and students can gain practical skills, learn to gather and manipulate data, develop problem-solving skills, simulate professional practice, etc. Undergraduate research experiences can be divided into two distinct categories: ‘Undergraduate Research Experiences’ (UREs) and ‘Course-Based Undergraduate Research Experiences’ or CUREs (Linn et al., 2015; Auchincloss et al, 2014). Research internships and work placements fall under the category of UREs. These tend to be bespoke and individualized; they typically affect only a few students and, because of the resources and time required for their delivery, in many cases falls outside their regular taught curriculum. CUREs, on the other hand, are embedded in the regular curriculum and therefore open to all students on a module/programme; they tend to be less individualised, less resource intensive and typically easier to deploy (Auchincloss et al, 2014). Assessing the impact of UREs and CUREs on student outcomes is challenging (Linn et al., 2015). However, the available evidence suggests that engaging undergraduates in research activities improves student engagement and retention; it can also attract students into postgraduate research careers (Auchincloss et al, 2014; Gregerman et al, 1998; Lopatto, 2007; John et al, 2011).

In order to provide strong links between research and teaching in the undergraduate curriculum, academics must encourage and facilitate an inquiry based approach to learning, in which the focus is on the student learning experience, rather than on teacher excellence (Healey and Jenkins, 2009; Elton, 2001). Students go from being the recipients of knowledge to become collaborators in the production of knowledge. Research and research-like activities are put at the centre of the curriculum, and the focus is on students learning in an active (research-like) manner. In the Life Sciences section at Canterbury Christ Church University, we call this approach Research-involved teaching.

The aim of this workshop is to share strategies to develop an undergraduate curriculum with a strong research focus. Through discussion with the participants, we will share ways to:

- design an assessment strategy which promotes research and graduate employability
- develop learning and teaching activities which embed research into the science curriculum

- create opportunities for undergraduates to participate in research experiences beyond the formal curriculum (e.g. conference attendance or article publication).

## **2. ‘Undergraduate Research Experiences’ (UREs) and ‘Course-Based Undergraduate Research Experiences’ (CUREs) in the section of Life Sciences**

The Section of Life Sciences at CCCU currently delivers eight undergraduate programmes: three-year BSc Honours in Animal Science, Biomolecular Science, Bioscience, Ecology and Conservation, Environmental Biology, Environmental Science, Integrated Science, and Plant Science. These can also be taken as joint-Honours programmes with other disciplines (e.g. Sport Science). All programmes can be taken as four-year programmes with an additional Foundation Year in Science. The Foundation Year is designed to facilitate entry of students who do not have the necessary qualifications to study at university. It has no entry requirements and traditionally recruits students from highly diverse backgrounds (e.g. mature students, ethnic minority students, students from areas with low participation in higher education). Currently there are 500 students enrolled in our programmes. We have a diverse student body: our full-time undergraduate students are more likely to be from underrepresented groups in terms of gender (44% versus 35% nationally), non-white ethnic groups (26% versus 19%) and reported disabilities (18% versus 10%) (HESA, 2016).

Research-like experiences, both CUREs and UREs, feature from very early on in the student journey as part of the taught curriculum. Students are given opportunities to participate in research throughout their studies. These research experiences are coordinated across the years of study to build upon each other and provide continuity in student engagement with research. First year students are introduced to the concept of undergraduate research and to opportunities for becoming volunteer researchers in the first month of their studies, via the research ‘Mini-Conference’. A research internship programme open to students in any year of study is also available. The creation of an Industry Liaison Laboratory in a nearby industrial park has greatly expanded and strengthened the delivery of CUREs and industry-linked UREs. Research-relevant experiences are also embedded into modules through assessments. For example, students complete their degrees with a research project, in which they produce a research paper following the format of a real scientific journal, a project logbook and an oral/poster presentation in a conference-style day. In other modules students are asked to write up their work (e.g. the result of a mini research project) as research papers, following the instructions for authors from current scientific journals. It is not uncommon for our undergraduate students to co-author publications, posters and conference presentations with academic staff-reviewed journals. An annual competition is held to send one or more undergraduate students to the British Conference of Undergraduate Research to present the results of their individual research projects to an audience of their peers.

## **3. Conclusions**

The aim of this workshop is to share strategies to embed research into the undergraduate curriculum. Developing programmes with a strong focus on research and enquire, what we have called Research-involved teaching, can be achieved by a combination of low-cost, more general CUREs (e.g. the mini-conference, research-relevant assessment) and bespoke, more resource intensive UREs such as internships or students attendance to research conferences,. It is essential that innovative models for CUREs, UREs are developed and deployed in a coordinated way throughout the undergraduate curriculum, to maximise their power and impact in transforming student learning.

### *Acknowledgements*

The authors would like to thank students and staff from the section of Life Sciences at Canterbury Christ Church University for their involvement in the research-involved teaching initiatives described in this paper. We are also grateful to the University for funding and supporting research-involved teaching initiatives in the Section. We would also like to thank our industry partners who contribute to the delivery of research-involved teaching.

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# **VOLCANOES, MERMAIDS, CASTLES AND FORESTS: UTILIZING CREATIVITY TO ENHANCE STUDENT ACHIEVEMENT AND ENGAGEMENT WITH UNIVERSITY SERVICES**

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## **Abstract**

Student engagement with university programmes and services is an important indicator linked to retention and achievement (Trowler, 2010; Kuh, 2009). However, while much literature exists concerning connecting students with lecturers and subject materials, achieving engagement with support services such as mental and physical health, and academic skills support can be challenging. We consider how, by creating a welcoming and enjoyable student experience, engagement with support services can be increased.

The Student Success Festival (SSF) was designed to actively encourage student participation through the concept of areas on 'Adventure Island', a visual metaphor conceptualising the various academic support services, wellbeing services, physical activity, nutrition and mental health: all contributing to the development of a successful student (see Kuh, 2009). Utilizing theories of gamification and dialogical learning, students were encouraged to visit different areas on the island, to play study-skill based games and receive advice and help from staff, as well as booking follow-up workshops to access further support. We outline how student dissatisfaction and a lack of engagement with a previous, more static event led to this. We also refer to the strategic drivers behind the SSF, outline challenges we faced implementing the various elements in collaboration with a wide range of services and the Student Union, and reflect on what we have achieved and how the SSF might develop. Employing an interactive approach, we encourage participants to reflect on and consider student needs in their own institutional context, with an aim of sharing and co-creating best practice.

**Keywords:** *Engagement, Retention, Success, Creativity, Innovation.*

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## **1. Introduction**

Our central principle is to facilitate our students' learning and development while at Middlesex; in this we recognize we are not alone, student engagement has been recognized as an important aspect of their success (see Trowler, 2010). Building on this, we align with theories of dialogical educational practices, student empowerment and ownership, and critical engagement (for example Burbles & Berk, 1999). However, our situation is perhaps not so clear cut in terms of *how* we engage our students. Working in Library and Student Support (LSS), we are not affiliated with any one School, instead serving students from the multiple Schools at Middlesex University, from foundation to doctoral levels. Thus, while we agree with the literature regarding the importance of student engagement, we have found that the focus on course content or lecturer-student relationships has not spoken directly to our situation.

This leads us to the subject of this paper: how to engage students and raise awareness of university services: students are often only dimly aware of the support available to them and so only use them when in dire need, rather than utilizing them systematically. For a number of years, LSS ran an annual event, ReWise, with the aim of engaging students with the support we offer, specifically looking at examinations and assessment. However, it became apparent that this event was not achieving its intended aim. Student participation was lackluster, and the event was poorly perceived among both the student body and institutional stakeholders. Therefore, we decided to overhaul the event with the aim of improving student engagement with both it and the services it promoted, as well as increasing its standing among stakeholders. Thus, the Student Success Festival (SSF) was created.

This paper will take a reflective, experience based approach (Vetter & Russel, 2011) in order to discuss our approach to promoting student engagement with Middlesex University student support services, via the SSF. We are currently gathering data, but will provide early stage feedback from students and stakeholders where possible.

## 2. Reimagining the event

When conceptualizing the SSF, we drew on feedback from stakeholders and students regarding the previous offering, ReWise. This analysis provided us with two key improvement points: (1) students felt the event was unclear, unengaging and thus did not participate in it; (2) stakeholders could not understand their role within the event, or how the event aided them in promoting their services. We surmised that if the old paradigm was ineffectual, it was time to try something new. It also became clear to us at this stage that for the event to be more useful to our students, the remit needed to be widened from a purely examination and assessment focus, to a more holistic concept of 'student success'. While initially this may seem unfocused, we felt that it was more transparent from a student perspective (we recognize the various nuanced economic and social factors that contribute to success, but from a general perspective the meaning of 'success' and its positive connotations are clear). In this we do not deny the complexities of the phrase 'student success', but instead take a more pragmatic approach in terms of this event. Also, by widening the concept to 'student success', we were better able to include a wider variety of concepts at the SSF (for example, healthy eating and exercise) which were harder to conceptually relate to the idea of examinations and assessments. We regard this variety of academic skills, mental wellbeing, physical health and nutrition as all contributing to student success (Kuh, 2009).

## 3. Improving Student Engagement

We firstly considered ways to make the event more engaging from a student centered perspective. Working under this new parameter, we arrived at the idea of a celebratory, festival style event, the aim being to create something which would be memorable, fun, and would encourage participation. This idea was then discussed with representatives from the Student's Union and Student Learning Assistants (SLAs), who worked as an informal focus group. Building on their advice, we settled on an overall theme of an Adventure Island which would encompass four 'zones', each based around a type of support (Waterfall Zone (Wellbeing): Disability and Dyslexia, Counselling and Mental Health, Sports and Recreation. Forest Zone (Students helping students): MDXSU (the Student Union) and various Student Societies. The Volcano Zone (Working with the system): Registry and Progression and Support. The Castle Zone (skills): Learning Enhancement Team, Student Learning Assistants, Employability, Library Services.)

Students were encouraged to visit all the zones and interact with staff from the various support teams, creating something that was informative, memorable, humanizing of our services, and holistic. Each zone also included activities for students to complete. These activities were designed around skills which each service promoted, so, for example, in the Waterfall Zone, students could find mindfulness activities and relaxation exercises provided by Counselling and Mental Health, as well as physical games and sports equipment provided by Sports and Recreation. In this way, services were showcased in terms of the benefits they offered students rather than being restricted by university structures and hierarchies. Additionally, students studying Art & Design and Science & Technology designed & created props and staging for the zones, and SLAs worked on the castle zone and the Students Union ran and organized the forest zone.

We drew on theories of gamification to engage our students in zone activities. Gamification works on the basis of challenge and reward, promoting task achievement, without the fear of failure (Stott & Neustaedter, 2015). The benefits of gamification in our context therefore encouraged students to participate in skills acquisition in a non-threatening manner. Additionally, many of the activities incorporated task-based learning approaches (see Ellis, 2003), which also promote active engagement, learning and are again low risk. Thus, activities served a twin purpose: they encouraged students to meet with service providers and to engage in dialogue with the service, while at the same time providing them with a skill or resource 'there and then'.

Initial data from anonymous student questionnaires collected on the day indicate a positive response. Multiple-choice questions revealed that respondents understood that a wide range of the services involved in the SSF could be of help to them. The open question "What have you learnt so far at the festival today?" provided equally encouraging feedback, sample answers being, "That everyone seems happy to help out and take out your stress", and "How I should consider my current path and what I should do to achieve success". From anonymous stakeholder questionnaires, the response to the zones and activities was equally encouraging, with statements including: "I think that in the context of the event, the activity was useful in terms of introducing students to some of the services".

#### 4. Stakeholder Role

We also aimed to clarify the role of stakeholders within the event and to work with them in contextualizing their support for students. We felt that both these aims could be met through the visual metaphor of 'Adventure Island'. While Middlesex University is extremely proactive in providing support for students, it has been our experience that students themselves can become confused by the complexity and variety of support on offer and do not necessarily understand how it can be accessed to improve their chances of success while studying or after graduation. For example, a student may see Academic Writing and Language for writing guidance, but if they have a learning difficulty they need to see Disability and Dyslexia, if they are in danger of failing they should speak with Registry, if they need help finding research material they should ask a librarian. While we, as insiders in the system, know these processes, students often do not.

In terms of ReWise, this meant that students, when they did approach services, tended to approach only those services whose 'value' was already known to them. This, we felt, had then gone on to disenfranchise the students from other services. Thus, by grouping services thematically on Adventure Island, the SSF created a cognitive 'foothold' for students to understand how these services work together. Equally, the metaphor of an island, we argue, also aided students in recognizing that these services, while different, were part of the same overarching system, a system designed to help them. For stakeholders, this resulted in more students speaking with them, and thus the event holding greater value. As word spread, we were approached by a number of other stakeholders, external to LSS, including the Erasmus Program and Kortext (electronic academic text books). We also liaised with Chartwell's, the University's hospitality company, who provided a smoothie and healthy snacks bar, all of which was free for students at the SSF. The end result was an event that was much more representative of all the support services and opportunities available to Middlesex University students, presented in a way that was both novel and engaging.

Initial data from anonymous stakeholder questionnaires indicate a positive response. 92% of respondents felt the change from ReWise to the SSF was successful and improved student engagement with their service, and 79% thought the Adventure Island concept was effective in providing a unifying theme for the event. Amongst the respondents, 81% expressed interest in a future SSF. Comments include: "The event was fun and didn't involve staff sitting behind desks trying to sell their service. The level of interaction was really positive and made sure all students made contact with each area to learn about the support available", and "Good aesthetics with the theme and element of fun. Less corporate".

#### 5. Conclusion

The Student Success Festival aimed to promote the various support services available at our institution, and remove barriers to student engagement with them. Our initial remit was based on the principles that students were either unaware of the variety of services available to them, or did not utilize these services in a holistic manner to aid their effectiveness. By taking a creative approach to the concept of the event, thematizing the service provision in a manner that was student centered rather than based on the organization structures of our institution, and working with the principles of gamification and task-based learning, we were better able to encourage student engagement, and have ideas and approaches to continue building on. Thus, we argue that recognizing students are not passive consumers, but will respond to challenges and alternative methods of communication, yields results. Equally, allowing for creativity and 'fun' when promoting student engagement can have positive outcomes.

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## FREE FLOWING CONTENT

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### Abstract

Higher education institutions around the world are exploiting information and communication technologies by increasing the use of videos both online and in class. This move was initiated by the ‘early adopters’ who by definition are I.T. literate and favor ICT innovation. However increasingly it is institutions making strategic decisions which impact departments or courses. Consequently there are many teachers involved who are not well equipped to transition. The literature is rich with case studies and quantitative research on implementing video in the classroom based on adopting new techniques, although by design they focus on the early adopters and ICT literate. The fallacious assumption that all teachers are IT literate and prepared for this new form of teaching is illustrated by Brecht for example “Using a personal computer, an instructor can create them quickly and easily” (2012p. 75). At a management level, asking teachers to radically change practice could cause anxiety in those for whom ICT is intimidating and this can lead to uncertain outcomes. The purpose of this workshop is to discuss how barriers to implementation can be removed. Participants are expected to be a mix of educational researchers and institutional leaders. It is hoped to expose the researcher, who by enlarge will be early adopters of ICT, to concerns of the management in imposing radical technological change. This paper sets out the methods used to assist teachers take the maximum benefit of their existing content as presentation style lectures and utilize them in both flipped and online classes. At its core, the practical part of the workshop is about removing the fear of the presented self and enabling participation in creating active learning environments. The methodology utilized in the workshop unlocks the potential for whole institutions to make course and department wide moves towards better classroom practice and e-learning opportunities.

**Keywords:** *Flipped class, online teaching, active learning environments, video lecture, recording lectures.*

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### 1. Introduction

Higher education teachers often use lecture style in their teaching because it is relatively simple to prepare (Kozma, Belle, & Williams, 1978; Watson, 2006). Presentations seem convenient even though the role and effectiveness of lecturing is highly debated (Williams & Fardon, 2007) Affordances offered by ICT, an increasing number of higher education institutions (HEI) across the world are transitioning from traditional “on campus” classes to partially (blended) or fully online classes (Welsh & Dragusin, 2013) while aiming to maintain and improve active, engaging and rich learning environments (Keengwe & Kidd, 2010; Van Weert, 2005). Integrating ICT and pedagogical practices can improve students’ learning via the affordances they offer (Webb\*, 2005). As with any change environment, the early adopters have high motivation and are continually evolving practice. However, problems arise when entrenched practice needs to evolve too.

There are barriers that entrenched practice must overcome when integrating technology into teaching and learning. Many faculty members are reluctant to convert their traditional on campus routines to an online format (Keengwe & Kidd, 2010; Kukulka-Hulme, 2012) because it requires a change in teaching practices, when teachers not only have to adopt a more student-centered teaching approach, but also simultaneously develop new technological skills which can be time consuming and frustrating (Davis, 2016). Not only do teachers spend more time on learning technology (such as a new recording software), they also have to develop new skills in designing online courses and providing on-time feedback to students (Kukulka-Hulme, 2012; Lawless & Pellegrino, 2007). Methods applied in a traditional class do not fit an online class as the environments are entirely different (Keengwe & Kidd, 2010; Kim, Kim, Khera, & Getman, 2014). Moreover, according to Nelson and Thompson (2005) and

Allen and Seaman (2008), lack of faculty time and workload, lack of support, assistance, as well as training, by institutions impedes teachers' engagement in online teaching practices. Such impediments are barriers to implementation because teachers cannot or will not participate fully which will lead to inconsistent outcomes. The aim of this workshop is to discuss an approach used to remove the barriers to using technology for flipped and online teaching.

Rienties and Toeteneel (2016) describe that content type is far less important than learning design aspects which allows for teachers to experiment with different recording techniques. The approach to be discussed is moderated by utilizing their existing skillsets in a familiar environment which goes a long way to removing the barriers and sets up the free flow of content for use in e-learning.

## **2. Design**

The workshop will proceed with a demonstration of a methodology for removing the perceived barriers for teachers who are reluctant to record their lectures. The methodology will be available for participants to try in the workshop with their own material. Participants will make their own videos and adapt such an approach for themselves to know how barriers can be removed.

Every institution has its own cultural setting and this will also be discussed in the group. This will be followed by an interactive session where techniques are discussed and examples from the participants relevant for their setting, are solved live in the workshop.

## **3. Primary Objective**

The primary objective is for participants to engage with identifying barriers. By combining the early adopters with those who are more hesitant to make recordings, or try new software, it is hoped to expose the barriers. The discovery period will expose that the barriers experienced are both individually and institutionally specific. The workshop explores that moderated via the technology the perception of the self is illusory, and when users start from a safe environment and are using the technology before they realize the implications, the barriers are effectively removed.

### **3.1. Participant Objectives**

The participants' objective will be to solve some of the dilemmas associated with the institutional move into flipped, blended and e-learning. This change requires a rethink about the lecture format and its suitability for these new environments. The dilemmas are created by one of the following:

- The resistance to changes directed by leadership and improving staff moral as they approach radical changes in practice
- The fear of the presented self
- How to best utilize content already existing as presentations, no planning, scripts etc.
- Where does one fit this into a busy schedule, or the perception of additional work.

The participants will have the opportunity to hear how these dilemmas can be resolved in different context, utilizing different strategies.

### **3.2. Main Participant Take-Aways**

Most participants will achieve some recorded videos to take away with them. More importantly the experience from multiple institutions and a variety of context will make the methods relevant for most situations. Participants will also be able to reflect on their existing practice, and look at their existing content in a refreshing and inspiring way. After the workshop it is expected that:

- new teachers will be able to learn how to produce video for a variety of contexts, such as flipped, blended and e-learning
- Experienced teachers will be able to utilize the vast store of existing content and quickly and easily turn them into fun and inspiring video
- Researchers will be able to expand research from the early adopters, advanced ICT users and the highly motivated to those who are reluctantly evolving practice.
- That the free flow of content from existing presentation formats to video, inspires an increase of flipped classes and blended environments being practiced in every participant's classes.

#### 4. Summary

Teachers approaching a new paradigm face uncertainty and are reluctant to embrace video recording technology, especially if it is forced upon them. We found it was possible to harness existing content by transforming presentations into animated videos simply and easily, and teachers could achieve the change within the time allocated for their current teaching. Teachers are experienced at delivering their content so often feel that no additional preparation such as script writing is required. The methodology discussed in the workshop opens the door for the free flow of content into new formats better suited to flipped, blended and e-learning.

The methods utilized in the workshop reflect the requirements of changing whole departments or courses and including teachers that are not comfortable with radical changes to their lecturing environment. The research behind the methodology was based on a longitudinal study in action research at a Danish HEI. The results showed that the very real fear of the presented self is a perception, and the only way to break that perception is via the technology, because both the presenter and the audience are the same. However teachers who are reluctant to embrace technological change or find it stressful are stuck, with heightened fear, sensitivity to the complexities of what is being asked of them. The outputs on which this workshop is based focuses on familiar technology, in a familiar space, where a teacher finds that recording takes no additional technology, no additional practice and before the fear sets in, have a successful recording in the hand. This process exposes the perceptual nature of the barriers to participation allowing teachers to focus on making content better suited to new contexts.

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