inScience Press

Education Applications & Developments III

Editor: Mafalda Carmo

Advances in Education and Educational Trends

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Advances in Education and Educational Trends Series

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Published and distributed by:

Rua Tomas Ribeiro, 45, 1ºD, 1050-225 Lisboa, Portugal
www.insciencepress.org

Printed by:

GIMA - GESTÃO DE IMAGEM EMPRESARIAL, LDA.
CET - Centro Empresarial Tejo, Rua de Xabregas Nº 6 - Lote B
1900-440 Lisboa, Portugal

Printed on acid-free paper

ISSN of Collection: 2183-2978
ISBN of this Volume: 978-989-99864-7-3

Legal Deposit: 441970/18

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FOREWORD

InScience Press is delighted to publish this book entitled *Education Applications & Developments III* as part of the Advances in Education and Educational Trends series. These series of books comprise authors' and editors' work to address generalized research, albeit focused in specific sections, in the Education area.

In this third volume, a dedicated set of authors explore the Education field, contributing to the frontlines of knowledge. Success depends on the participation of those who wish to find creative solutions and believe their potential to change the world, altogether to increase public engagement and cooperation from communities. Part of our mission is to serve society with these initiatives and promote knowledge, therefore it requires the reinforcement of research efforts, education and science and cooperation between the most diverse studies and backgrounds.

The contents of this edition show us how to navigate in the most broadening issues in contemporary education and research. In particular, this book explores three major areas within general Education's theme, corresponding to three sections: "Teachers and Students", "Projects and Trends", and "Teaching and Learning". Each section comprises chapters that have emerged from extended and peer reviewed selected papers, originally published in the proceedings of the International Conference on Education and New Developments (END) conference series (http://end-educationconference.org/). This meeting occurs annually with successful outcomes. Original papers have been selected and its authors were invited to extend them to once again undergo a review process, afterwards the authors of the accepted chapters were requested to make the necessary corrections and improve the final submitted chapters. This process has resulted in the final publication of 19 high quality chapters organized into 3 sections. The following sections' and chapters' abstracts provide some information on this book contents.

Section 1, entitled "Teachers and Students", provides studies within educational programs and pedagogy for both tutors and students. Each chapter is diversified, mainly addressing thematics in teaching identity, quality learning, teacher-student relationships and curriculum and practice, amongst others.

Chapter 1: *The Teaching Excellence Project: A Framework for Leading Integrative Change and Quality Learning in Technological and Vocational Education*; by Hua Hui Tseng. The use of the Teaching Excellence framework developed in the UK Government Green Paper (2015) and the Taiwan Stage Two Teaching Excellence Project (TEP) implemented at the Tainan University of Technology (TUT), Taiwan, between 2009 to 2016 is documented in this narrative study. With the goal of improving domestic universities' teaching systems, the TEP framework includes

effective teaching, support, assessment, and learning opportunities that lead to students becoming successful and responsible learners. Improvements in teaching quality were identified and implemented at the TUT based on this framework. The areas and practices involved using the framework to create university-wide commitment to comprehensive curriculum development. A general overview of the framework for leading integrative change is included and an explanation of how the dual objectives of the framework can be used as an index to measure the progress of change discussed. The case of the TUT provides insight into the implications of implementing the framework, one of which is excitement about teaching issues. The findings demonstrate that success involves creating a sustainable future that is realized by raising the quality of education, research, and development that supports the vision of collegial governance and academic freedom.

Chapter 2: *Values Education at Classroom Level in Vietnam: The Insider View*; by Quynh Thi Nhu Nguyen. This chapter explores how values education is implemented explicitly and implicitly at the classroom level in two upper secondary schools in Vietnam. Following a qualitative research design with semi-structured interviews of sixteen teachers and observation of their teaching, and focus group interviews of twelve students, the study findings focus on the most important values that should be taught, teaching methods and evaluation of values education at the classroom level. It reveals tensions in teaching values and initiatives which teachers use to promote values. The study concludes that it is necessary to select the value *honesty* as the key value to be taught in upper secondary schools in Vietnam due to cheating in examinations. Values education should be planned and prepared with the consensus of all stakeholders in a school community. Teacher modelling seemed to be a preferred way to teach values and the relationships between teachers and students should be friendlier. Furthermore, new educational strategies should be developed to help teachers regarding values education pedagogy and evaluation.

Chapter 3: *Curiosity and Students' Questions in the Teaching Process*; by Ante Kolak and Ivan Markić. Within the framework of teaching communication the attention of the researchers was focused on the problem of symmetry. Due to the complexity of the symmetry phenomenon in teaching communication the research was narrowed to student speech, i.e. to student questions. By considering the student question from different aspects the authors of this paper single out as important the number of questions asked by students during one teaching lesson as well as the types of questions asked as regards the presence or absence of students' curiosity. Therefore, the analysis of questions asked by students in teaching process during which students acquire new teaching contents, has also been singled out as a problem of research. The goal of this research is to establish symmetry (or asymmetry) of teaching communication and to analyse the questions asked by students. The results showed the constancy of asymmetrical communication in the

teaching process in almost all the teaching units observed, and the lack of students' questions, resulting from their lack of curiosity. Symmetry in communication and the largest number of questions arising from students' curiosity were seen in teaching units where the principles of integrated learning were applied.

Chapter 4: *The Impact of Intellectual Creativity Skills on Mathematics;* by Nurdan Özreçberoğlu, Çağda Kıvanç Çağanağa, and Ahmet Karahan. Creativity may be defined in the most general sense as producing different solution strategies apart from ordinary solutions when individuals encounter with a problem. The production process of such solutions should be designed with original ideas, which are sufficiently flexible and fluent. The aim of the research is to identify the methods used by mathematics teachers for the formation and development of creative, analytical and probabilistic thinking skills of students by taking both student and teacher views into consideration. In this context, it has been conducted in order to reveal the environments prepared, the methods applied and the assessment made by the teachers. The research was conducted in 2015-2016 at two public schools (colleges) which students can enrol after passing entrance examinations. The study group of the research consisted of 8 mathematics teachers and 8 college students randomly chosen from the public schools. Eight teachers and eight students determined by the convenience sampling method formed the sample of the research. Semi-structured interview forms containing open-ended questions were used as a data collection tool. In line with the results obtained from the research, it has been observed that the collected data support the views of teachers and students.

Section 2, entitled “Projects and Trends”, delivers chapters concerning, as the title indicates, education viewed as the center for innovation, technology and projects, concerning new learning and teaching models. Knowledge in different usabilities, communication, software and new methods of teaching and learning and concerns with parental involvement in children's education are used to compile these works.

Chapter 5: *The Mothers of Special Needs Children, Coping Styles and Educational Involvement*; by Aviva Lavan an d Lipaz Shamoa-Nir. The purpose of this study was to examine the effects of stress and coping style with stress among mothers of children with special needs on their involvement in the school. The findings indicate that an emotional coping style predicts a high level of stress among all mothers. Comparing mothers of children with special needs with mothers of normally-developing children, higher levels of stress were found among the former. However, this difference was not reflected in the involvement at the school which did not differ between the two groups. Moreover, it was found that mothers of children with special needs make more use of a social support coping style. The findings contribute to the investigation of predictive factors of parental stress and parental involvement in children's education.

Chapter 6: *Flipped Classrooms, Flipped Homes? Tending to Students' Personal Competencies*; by Eva N. Patrikakou. Sharply increased workforce demands for computer skills are due to the significant effects that technology and media use have had on several aspects of daily life. 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 is indispensable to enhance the individualization and differentiation of learning, and serves as the pillar of competency-based education. The swift pace of change, however, has raised concerns and reluctance from practitioners and other stakeholders. As with any and every innovation, its use is as good as its users. Educators who are utilizing technology and media advances in a targeted and purposeful way can 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. The flipped classroom framework is discussed as a context in which media integration can foster competence-based, personalized education.

Chapter 7: *Entry into Greater Diversity – Interdisciplinary Scientific-Technically Project Laboratories - New Learning Settings in a Globalized World*; by Beatrice Moreno, Sophie Kröger, Anett Bailleu, and Andreas Münchow. Since 2013 HTW Berlin has been working with a special form of interdisciplinary project laboratories. This kind of learning process is characterized by very active participation of the students and it creates open spaces and opportunities for international cooperation. Students exert their influence on the contents of the projects and lectures during the course. The teaching process based consequently on partnership of the students and the teaching staff. The courses consist of students from different departments of the HTW Berlin. Participants are supervised by scientific-technically oriented interdisciplinary professional staff. Thereby the learning setting intends to motivate Bachelor (BA) and Master (MA) students to conduct independent development and research, to apply new form of presentation skill and to engage on an international level scientific discussion. Interdisciplinary project laboratories courses are particularly suitable for new methods of transcultural learning. The methods and goals of the courses are designed to be carried out on the basis and demands of a world with grown mobility and immigration.

Chapter 8: *Toward Wider Explanations of Technology Adoption: The Case of Secondary Education Teachers in Bucharest, Romania*; by Andrei Ogrezeanu and Cezar Scarlat. The dominant theoretical model in the field of technology adoption by individuals, TAM, has come under recent criticism for having had an oversimplifying effect on research.This paper aims to widen the universe of

possible explanations of *ICT use* and *intentions* of use, by simultaneously testing for a large number of variables advanced by the main theories in the field. The study is based on a survey of 845 secondary education teachers primarily from Bucharest, Romania.Our regression analysis (OLS) results show that: 1) a high percentage (60%) of variance is explained; 2) the results of the *use* and *intentions* models are quite different; main relevant direct explanatory variables for use express capability, opportunity and social influence: *ICT access*, *ICT skills*, and *observability*; while the main explanatory variables for intentions are *computer enjoyment*, *compatibility*, *perceived usefulness*, *image* and *self-efficacy* denoting psychological motivations; 3) TAM variables, *perceived usefulness* and *perceived ease of use*, don't play a very important role (the former is significant in the model of intentions only, and the later not at all), suggesting that broader models of direct determinants of technology adoption need to be constructed.

Chapter 9: *Master Degree Students' Proposals and Opinions about Innovation in the Secondary Education in Spain*; by María Luisa Renau Renau. This present paper describes the research carried out in the subject of the *The University Master's Degree for Secondary Education, Vocational Training and Language Teaching* at the University Jaume I (Castellón, Spain): 'Teaching Innovation and Introduction to Educational Research' in the specialty of Language and Literature and Language Teaching. 245 students were enrolled in this subject. As part of the subject´s assessment, students were asked to work in groups in order to write a research proposal divided into two main parts: (i) theoretical background (definition of innovative teaching, main trends and authors and some examples of innovative projects), (ii) students define the innovative tool/resource they have chosen (e.g. blog, podcasts, digital books, Mahara, fakebook, etc.) and design a didactic unit using this virtual tool. In this paper, we analyse the virtual resources chosen by our students and reflect on their feelings and opinions about the implementation of these new innovative materials in a real secondary school classroom. Results show that these innovative tools can help secondary school teachers to enrich and improve the teaching/learning methods by supporting the traditional methods but, by no means, substituting it; however not all our students think about the possibility of implementing them.

Chapter 10: *The Impact of Neoliberalism on TVET in England*; by Eleanor Andressen and Johannes L. van der Walt. Neoliberalism, as embraced by many employers in England, has had a number of impacts on Technical and Vocational Education and Training (TVET). Among others, it introduced performance measures to every aspect of the system, not just to learner achievement, thereby giving employers a dominant role in the TVET sector. This chapter focuses on the historic relationship of employers in England with the education and training sector and explains where the disproportionately strong role of neoliberal employers originated and how it persists to this day. It also explains how the problematic role of neoliberalism in the mind set of employers has contributed to the partial failure

of government policy in TVET in that this education and training sector is being shaped in accordance with the demands of large employers, to the detriment of wider sector and of economic skills growth. The chapter also reflects on the barriers that neoliberalism erected to the creation of a TVET system which can truly address the needs of the economy as well as of individuals as total human beings. It concludes by suggesting ways in which some of these issues might be resolved, for example, through better partnerships with a wider group of stakeholders, such as universities, government and parents.

Chapter 11: *Analyzing Values Education in Schools in Germany. Theoretical Model and Empirical Data*; by Birgitta Kopp and Heinz Mandl. The main objective of this contribution is to introduce a model for analyzing values education in institutions, and to illustrate this model by providing data on projects fostering values education in schools in Germany. Our model includes five levels, namely (1) needs/objectives of practical values education, (2) the macro-level (politics and society), (3) the meso-level of institutions, (4) the micro-level of interactions between individuals, (5) and the outcomes of practical values education. The presented model is exemplified by projects that were launched in schools in Germany in the years 2009 to 2014. We identified 51 school projects that were analyzed according to our model. Results show that using this model for analyzing values education is an effective way to obtain a systematic overview about different projects for values education. Even though needs/objectives, meso-level and micro-level are reported in these projects, often, key issues for explicitly evaluating the outcomes of the projects on values education are missing.

Chapter 12: *How to use Robotics in Education*; by Leonardo Mesquita, Galeno José de Sena, and Matheus de Felippe Ferreira. This article describes a method for structuring and developing training programs based on educational robotics. The method can be applied in short-term programs, such as workshops, as well as in longer-term courses. We also present a mini-course structured according to the method, proposed and applied in form of a workshop to students and teachers of public secondary schools. The use of educational robotics to stimulate student learning in public schools is a reality in several developed countries of the world. In the Brazilian context, the main motivation underlying this project is the shortage of laboratories and materials for the development of experimental activities, observed in public schools. Thus, the development of the course allows not only students, but also their teachers, a contact with technological innovations, in particular in the field of educational robotics. The developed mini-course covers the topics and concepts of electronics and programming based on the Arduino platform, aiming to present the main resources available in this platform to propose and develop robotic-based educational activities. The course presupposes an active attitude of the students, who are instigated to "get hands dirty", which also contributes to their formation, through the development of new skills and abilities.

Chapter 13: *Learning to Design during Pre-Service Education*; by Jacquelyn Baker Sennett. This chapter examines design thinking as a pedagogical tool to support the learning of pre-service teachers and human services professionals. Over the course of a 10-week period fourteen pre-professionals completed design projects that involved working with children/youth, teachers, families and/or community members with the goal of arriving at meaningful and creative solutions to challenging educational and/or community-based issues. Pre-professionals learned and practiced four stages of the design process that included learning how to empathize, define, ideate, and prototype. Participants documented their progress in hand-written and hand-drawn sketch books and they also completed online surveys and semi-structured interviews. The chapter focuses on two descriptive case examples, considering affordances and barriers to prototype development while one pre-service teacher designed the prototype for an online writing game and a pre-service human services professional developed the prototype for a substance abuse learning game. Findings from this exploratory work offer suggestions for future research and the re-vision of pre-professional education in ways that incorporate design practices.

Chapter 14: *Rapid Enrolments in Higher Education: Implications on Teaching and Learning*; by Jane Iloanya and Abbas Lusenge. 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 enrolment figures in tertiary institutions. This book chapter examines the implications of rapid enrolments on teaching and learning in higher institutions of learning in Botswana. Through a qualitative approach, semi-structured interview questions were used to elicit information from lecturers and students of two selected institutions of higher learning in Botswana. The chapter concludes by providing some possible solutions to the challenges posed by rapid enrolments in higher education.

Section 3, entitled "Teaching and Learning", offers research about foundations in the education process itself, in various contexts, both for educators and students.

Chapter 15: *Dysgraphia, Educational Interventions and Didactic Implications: from Prevention to Intervention*; by Angelo Luigi Sangalli, Angelo Lascioli, and Andrea Lascioli. Dysgraphia is a widespread disorder among school children. The prevalence for developmental writing disorders is about 7–15% among school-aged children (Döhla, & Heim, 2016; Katusic, Colligan, Weaver, & Barbaresi, 2009). It has become clear now that learning to write has an unquestionable educational value. According to Konnikova (2014), it is not only what children write that matters, but how they write. That's why we need to examine and understand which education and didactic methods can be useful to teach handwriting to those

children that find it difficult or that, despite all the efforts, have an unreadable handwriting. It is also necessary to investigate the best way to intervene, especially since writing difficulties are often related to other learning disabilities. This paper contains the conclusions of a lengthy period of observations and data collecting on those children identified by the authors, who suffer from writing difficulties. This work was aimed at identifying an educational working methodology to prevent writing difficulties or recover from them. We will describe here early manifestations of dysgraphic disorder and show efficient educational and didactic intervention tools within the school context.

Chapter 16: *Fostering Critical Thinking in Teacher Education*; by Ginette D. Roberge. 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, 1999). The purpose was to examine the extent of critical thinking cues that participants utilized when reflecting, in writing, on a controversial problem that they could encounter in their practice after having received extensive instruction on various constitutive elements of critical thinking. These cues manifested by students helped inform on the effectiveness of the instructional approach utilized in the course. The results indicated that the majority of participants were able to propose new and innovative ideas, reflect and 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. Results of this study can help inform educational approaches and pedagogical practices that are conducive to nurturing critical thinking in adult students.

Chapter 17: *The Effects of Problem-Based Learning in Chemistry Education on Middle School Students' Academic Achievement and Attitude*; by Mona El Charif, Ahmad Oweini, and Samar Zeitoun. 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 cores, 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 experimental group was taught chemistry using PBL whereas conventional teaching methods were applied in the control group. Results indicated that implementing the problem-based learning approach had improved students' achievement and attitude. This study recommends that teachers implement problem-based learning in teaching science concepts especially chemistry for middle school students.

Chapter 18: *Learning in Home Language: Preferences in South Africa;* by Pule Phindane. The aim of this study is to investigate children and parents' preferences of language of learning and teaching (LOLT) in Grades 1 – 3 (aged between six and eight years), in Foundation Phase. This study is a survey in which questionnaires and interviews were conducted to collect data from identified stakeholders. The sample consisted of fifty learners, forty parents, thirty school heads, hundred and fifty Foundation Phase teachers and twenty Early Childhood Development teachers. Respondents were purposively selected from metropolitan, township and rural schools in Motheo district in Free State province in South Africa. The findings were that learners and parents preferred English as the language of instruction at Foundation Phase. The implications of these findings are discussed.

Chapter 19: *First Language versus First Additional Language(s) Teaching in Foundation Phase*; by Takalani Samuel Mashau, Humbulani Nancy Mutshaeni, Fhatuwani Ravhuhali, and Matodzi Grace Muremela. In a multicultural society like South Africa, where eleven languages are regarded as official languages, usage of language contributes towards quality education. If languages which are regarded as official according to the Constitution are used differently, this makes the different users of language to be disgruntled as their language is not recognised. In terms of Section 6 of the Constitution of the Republic of South Africa (1996) official languages are: Sepedi, Sesotho, Setswana, IsiSwati, Tshivenda, Xitsonga, Afrikaans, English, IsiNdebele, IsiXhosa and IsiZulu. The question which arises mostly is whether these (especially formerly marginalised) African languages are mastered by the children. The language of teaching and learning in most schools in South Africa is English. The chapter 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.

Special thanks to the above authors, editorial advisory members, and reviewers who contributed with their efforts to make this book possible.

June, 2018

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Section 1
Teachers and Students

Chapter #1

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

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ABSTRACT
The use of the Teaching Excellence framework developed in the UK Government Green Paper (2015) and the Taiwan Stage Two Teaching Excellence Project (TEP) implemented at the Tainan University of Technology (TUT), Taiwan, between 2009 to 2016 is documented in this narrative study. With the goal of improving domestic universities' teaching systems, the TEP framework includes effective teaching, support, assessment, and learning opportunities that lead to students becoming successful and responsible learners. Improvements in teaching quality were identified and implemented at the TUT based on this framework. The areas and practices involved using the framework to create university-wide commitment to comprehensive curriculum development. A general overview of the framework for leading integrative change is included and an explanation of how the dual objectives of the framework can be used as an index to measure the progress of change discussed. The case of the TUT provides insight into the implications of implementing the framework, one of which is excitement about teaching issues. The findings demonstrate that success involves creating a sustainable future that is realized by raising the quality of education, research, and development that supports the vision of collegial governance and academic freedom.

Keywords: teaching excellence framework, integrative change, quality learning.

1. INTRODUCTION

The TEP framework developed in the UK Government Green Paper (2015; Biggs, 1993; Gibbs, 2010; Graham, 2016; Havergal, 2016) and the Taiwan Stage Two Teaching Excellence Project (TEP; Ministry of Education, Taiwan, 2010) includes three dimensions of quality within education: presage, process, and product, which are better known as the 3Ps. The framework is used to gain a more accurate picture of an institution's educational provision. Implementation of the framework over a decade has resulted in the emergence of higher education models of change that have influenced educational organizations in the 21st century. However, researchers in the field still argue that the development of the 3Ps has not been tested over time and that the framework is still a loosely coupled structure (Dearing & Great Britain National Committee of Inquiry into Higher Education, 1997; Graham, 2016).

The 3P model, developed in 1993 by Harvey and Green, was applied at the Tainan University of Technology (TUT) as the TEP theoretical framework. Implementation of the model was expected to increase participants' enthusiasm and willingness to commit to change. The purpose of the exercise was to understand the learning process from the point of view of both students and faculty with respect to the dual objectives for implementing

the TEP framework with respect students and faculty to internal (university decision-making) and external (university mission) audiences. The TEP framework outlined in Biggs' (1993) 3P model was used to explore the learning process, build support and individual commitment, and monitor organizational results.

While Hashimshony and Haina (2006) observe that change at universities refers to reevaluating each activity in response to both the changing demands that have been placed upon universities and the emerging challenges these institutions face, in other words, 'value for money' and 'what employers want' (Berger & Wild, 2016, p. 9), it is critical that change begin within the context of the TEP. Within the last decade, universities have been operating in an environment of increased competitiveness and change. Measuring teaching excellence depends on indirect measures, such as rates of progression and attrition, student feedback and post-graduation employment rates; the precise data sets are outlined in the government's consultation document and formed the framework's quantitative element (Graham, 2016). According to Berger and Wild (2016), true is change in educaton institutions occurs with internal reward and recognition processes that bring institutional missions relating to research and education closer together.

Technology and some of the associated guesswork and anxiety have quickly pushed Taiwan into the global arena (Korka, 2011). As leaders of education institutions encounter an array of new questions and challenges, the leaders of the TUT have sometimes wondered what their efforts to prepare and adapt to change will bring. In order to create something of value, it is necessary to have a more rounded concept of education and to measure learning and teaching effectively and with imagination. This implies implementing unique inter-relationships between education, research, business, and professions within institutions for the 'value added' aspect of university's individual missions. The 3P model of the learning process theory constitutes the approach leaders of the TUT took with respect to its educational change processes.

In this paper about vocational education, the focus is the integration challenges faced by the TUT faculties and students. An overview of the TUT's vocational education and the factors affecting its development as well as the solutions used to stimulate excellence for the integrative mechanisms and initiatives are described. Thereafter, the process implemented at the TUT for influencing change in vocational education is discussed. Finally, the components (presage, processes, and products) that comprise the TUT's vocational education and the resources for development are outlined.

2. CONCEPTUALIZING THE CHANGE PROCESS

The TEP framework, which includes effective teaching, support, assessment, and learning opportunities, is designed to monitor and enhance the outputs of the TEP process, which includes progression, employability, and student satisfaction. That process relates to the dimensions of quality within education (Biggs, 1993; Gibbs, 2010). Each dimension represents a stage in the process of an organization moving from the status quo to a context characterized by peer evaluation, self-assessment, and professional activities for academics who are committed to change. Vocational education institutions offer education for specialties in the workplace (Lankard, 1996). Lankard (1996) discusses how the learning process seems to result from a change in students' perceptions of reality as related to the restructuring of courses and course requirements. The learning process is concerned with the way education systems engage resources and the quality of the students or academic staff (presage) that stimulate emotional engagement through appropriate learning contexts (process) and facilitate the emotional interfacing with outcomes (product) that are modified to help "conceptualize the powerful interrelationship between emotion, creativity and learning" (Spendlove, 2007, p. 155).

In this paper, a three stage framework for teaching that gives explicit guidance to teachers and simplifies the teaching process for students is reviewed. The first stage involves *adequate quality*, which is achieved through assembling processes and outcomes. The second stage is to create a 'sense of community,' which facilitates the cross-fertilization of ideas amongst the student body. The final stage is institutional missions, where the collective mindset is changed and new recognition processes and systems are put in place to produce lasting change for the university.

It has become increasingly apparent that the integration of academic and vocational programs have a substantial impact on students' learning processes (Lankard, 1996) and learning styles. Therefore, the learning process must be differentiated. In this regard, the TUT reviewed the Teaching Excellence framework's 3P model developed in the UK Government Green Paper (2015) and developed the Taiwan Stage Two Teaching Excellence Project in order to identify three learning processes that support students in their learning, namely, passionate champions, appropriate learning contexts, and interfacing issues.

2.1. Internal and external audiences (University decision-making and mission)

Change processes are unique and depend on the organizational life cycle of a college or university (Kezar, 2001, p. 92); Jarvis (2000) defined the UK comprehensive spending review (CSR) as the following:

> The recent CSR highlights the need for universities to be 'more responsive to the demands of [the] market, recognise the need to change their ways… and become more efficient.' (p. 52).

The study of dimensions of quality (presage, processes, and products) suggests that learning occurs as universities change their behavior in response to prior performance outcomes (Bingham & Davis, 2012). The dimensions illustrate how a principal perceives, processes, interprets, and reviews information and is focused on education professionals' misunderstandings of change approaches. The 3P model is integrated into the process of learning so that the solutions exhibit quality management in a way to which members of the institutions can relate. Kezar (2001) emphasizes that change creates stress for education professionals because the institutional structures and cultures they depend upon change with the efforts of the institutional directors. It is essential that those leading institutional missions communicate with their internal and external audiences directly and bring them on board to prevent misunderstandings.

2.2. Student factors and teaching context (presage)

In the presage stage, the 3P model for contemporary educational organizations and learning contexts is described; a specific focus is how presage (student factors and the teaching context**)**, as well as process (approaches to learning) affect the final product (learning outcomes). In the case of the TUT, the intention was to show that understanding two presage factors, namely, students' orientations to learning (measured using the Study Processes Questionnaire [SPQ]) and students' levels of cognitive engagement in a comprehension task (measured using SOLO) with a product factor (subsequent academic performance in two first-year music units measured using final grades) illustrate an understanding of the context and its processes. The SPQ measures general orientations to leaming or more specific approaches to leaming in given leaming contexts or across leaming tasks (Ramsden, 2003). SOLO taxonomy (Biggs & Collis, 1982) provide a systematic way of describing how a learner's performance grows in complexity when mastering academic tasks.

The TUT is a technology university. Technical and vocational education should take into account both the study and career needs of students (Ministry of Education, Taiwan, 2013). The presage step at the TUT was used to evaluate the quality of the students and academic staff to explain how the choice of teaching strategy, teaching intention, and conceptions of teaching and leaming enable or constrain the form education takes within an institution.

2.3. Satisfying learning experience (process)

In the process stage, the 3P model for contemporary educational institutions and learning contexts is described; a specific focus is the model's appropriate use in education. In the case of the TUT, the intention was to show that understanding the context and its processes are important and then illustrate how understanding the context and its processes could be accommodated.

At the TUT, the change began with a few key people who were members of the Teaching Excellence Committee (TEC) led by the principal. The TEC members supported and promoted faculty excellence and faculty development in the areas of teaching by selecting faculty for scholarly and/or creative pursuits' awards. The TEC members sponsored a department-wide survey of the TUT's 335-strong workforce. The results of the survey not only helped faculty define the problem areas but also provided a way for individual faculty members to participate.

The members of the Integrative Committee, as internal and external audiences, moved outward and spread the message throughout the school. The Integrative Committee members began weekly briefings that involved the principal's Chief of Staff and the Commissioner of the Department of Administrative and Financial Services. An overview of the 3P model for leading integration was provided to the principal's team. In addition, members of the team were asked for their support, which was forthcoming. Senior management teams of all the academic departments, the TUT's human resources managers, and the alumni of the TUT Alumni Association were briefed about a professional development program for senior managers.

2.4. Interfacing with outcomes (product)

The goal of the 3P model is to guide implementation of a system. With the 3P components of the integrative education model, change is focused on the process of learning or giving students tools with which they can become successful and responsible learners. Jacobs (1989) and Shoemakers' (1989) researches involved the implementation of curriculum integration and supported the efficacy of the 3P model. System changes, including implementing an on-going evaluation plan, were envisioned by the UK Government Green Paper (2015) and the TEP framework (Berger & Wild, 2016).

At the TUT, a Creating Integrative Change Template (CICT) helped with applying the relevant parts of the 3P model to the Music Department at the TUT that was aimed toward building new instructional approaches to reach every student. The 3P model that applied the TEP framework's dual objectives were included in the CICT template and have been critical to building integrative change in the Music Department's system. Implementation created a department-wide commitment to using flexible curricula to engage all students.

Form 1A (see Table 1), a model template, lists the two objectives of the 3P model with examples of implementation approaches that have evolved in teaching departments. Form 1B (see Table 2), with examples from the 3P model, offers a more comprehensive set of implementation strategies that include the two main objectives of the model for the existence, evolution, and effect of learning sequences. In the process, some instructional interventions were developed based on the CICT template, for example, school- and job-oriented learning within curriculum development processes.

Table 1.
Form 1A: Creating integrative change: Examples from the 3P model.

Form 1A. Creating an Integrative Change Model Template: 3P Model Objectives	**3P Implementation Examples**
1. Internal audiences (university decision-making)	Advocates present Practical Design for Learning to principals, school boards, and administrators; grant writing involving administration; reallocation of funds from various sources to make Practical Design for Learning work for all students.
2. External audiences (university mission)	Teaching aligned to the concepts of 'value for money' and 'what employers want', provide a holistic approach.

Table 2.
Form 1B: Creating integrative change: Examples from the 3P model.

Form 1B. Creating Integrative Change: Examples from the 3P Model	
lnternal audiences ▪ Advocates present to administrators and school board. ▪ Some administrators/principals spearhead work. ▪ Administrators support grant writing. ▪ Administrators support flexible fund allocation. ▪ Commitment to Practical Design for Learning at superintendent level.	**External audiences** ▪ Lessons that need to be borne in mind for the current consultation exercise. ▪ Outline past experiences of quality assurance. ▪ Group conceptualization of quality are differentiated into five categories: exception, perfection, fitness for purpose, value for money, and as transformative.

In Form 1C (see Table 3), the Learning Template, structured support for selecting those parts of the 3P model that might apply in other departments at the TUT is offered and new components as well as specific implementation strategies added, for example, scenario requirements based on both project and process characteristics.

Table 3.
Form 1C: Creating integrative change learning template.

3P/New model objective	Implementation Examples
Internal audiences	Enable or constrain the research, consultancy and knowledge transfer of activities within an institution (PRESAGE) Develop and evaluate a department-based framework for managing quality and standards at the undergraduate level (PROCESS)
External audiences	Planned and deliberate strategies and processes for academic management at the undergraduate level and graduate schools (PRODUCTS)

3. THE TEP FRAMEWORK: IMPLEMENTATION TREND

According to the three-year learning plan for the TUT's TEP, it was deemed necessary to initiate a Teaching Excellence Center. The Teaching Excellence Center, established in 2001, has as one of its goals that 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 for faculty was designed.

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 for students in 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 developments in higher education. Higher education is already a primary arena for competition among many countries with respect 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.

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 evident 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 constantly use the Center as a value platform to help guide the TUT's development. Those changes in education most likely to affect the TEC's ability to achieve its two goals are the following: (a) Public recognition of faculty members for their dedication, creativity, honed insights, and skills; and (b) faculty members' contributions to the realization of a high-quality learning environment for TUT students.

In the future, several key external factors in the Center's environment will need to be addressed. Due to the rapid change in 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 may be viewed as involving technology infrastructure, administrative support, teacher training, collaborative curriculum planning, creative funding, administrative support, redefinition of roles, and parent/community involvement. In this paper, a narrative case study was used to describe the implementation of the TEP framework for integrative change at the TUT. The framework appears to be an all-win program for schools, students, and enterprises (Berger & Wild, 2016; Ministry of Education, Taiwan, 2010). The rationale for implementing the framework was based on Berger and Wild's (2016) assertion that educational policy and practice should be integrated within 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, redefinition of roles, collaborative curriculum planning, parent/community involvement, and creative funding are the seven components supporting and regulating learning processes.

The TEP framework, which strengthens learners' links within chosen professions, when included in the cycles of curriculum planning and realization, becomes an integral part of learning process. It constitutes preconditions for the development of curriculum and vocational education quality in vocational school and colleges.

It is critical that leaders create learning and teaching strategies that add to their universities' future viability and the well-being of people and communities. In order to face the challenges that accompany social 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 involved in educational programs.

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Chapter #2

VALUES EDUCATION AT CLASSROOM LEVEL IN VIETNAM: THE INSIDER VIEW

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ABSTRACT
This chapter explores how values education is implemented explicitly and implicitly at the classroom level in two upper secondary schools in Vietnam. Following a qualitative research design with semi-structured interviews of sixteen teachers and observation of their teaching, and focus group interviews of twelve students, the study findings focus on the most important values that should be taught, teaching methods and evaluation of values education at the classroom level. It reveals tensions in teaching values and initiatives which teachers use to promote values. The study concludes that it is necessary to select the value *honesty* as the key value to be taught in upper secondary schools in Vietnam due to cheating in examinations. Values education should be planned and prepared with the consensus of all stakeholders in a school community. Teacher modelling seemed to be a preferred way to teach values and the relationships between teachers and students should be friendlier. 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.

1. INTRODUCTION

In recent times, values education has been an inextricable part of the school curriculum, considered as a pedagogy to increase quality teaching, students' wellbeing and social cohesion (Lovat, 2017; Lovat & Clement, 2008; Lovat, Dally, Clement, & Toomey, 2011; Lovat & Toomey, 2007; Lovat, Toomey, Clement, Crotty, & Nielsen, 2009). In many parts of the world, values education is an umbrella term including moral education, character education, ethics education, civics and citizenship education (Berkowitz, 2011; Lovat, 2011, 2017; Thornberg & Oguz, 2016). All types of school regardless of private or government sectors cannot exclude values education inasmuch the purpose of schooling itself is values laden. Indeed, values education refers to "any explicit and/or implicit school-based activity which promotes student understanding and knowledge of values, and which develops the skills and dispositions of students so they can enact particular values as individuals and as members of the wider community" (DEST, 2005, p. 8).

Whereas implicit values education is in line with hidden curriculum, mainly to build a positive and values-filled learning environment, explicit values education is embedded in the official curriculum content wherein values are taught directly and apparently (Halstead, 1996; Hawkes, 2010; Lovat, 2017; Thornberg, 2016; Thornberg & Oguz, 2013). Whether teachers are conscious of non-academic problems in the classroom or not, they might have to solve a range of dilemmas such as bullying, conflict and anti-social behaviour. Thus, values education is an imperative for maximising not only students' academic competences, social interaction and learning but also the quality of teaching and classroom management.

2. LITERATURE REVIEW

Hawkes (2010) proposes that in the school context, *respect* and *honesty* are primary values that should be stressed because they are fundamental tenets that guide behaviour. A comparative research study to examine Swedish and Turkish teachers' views on values education (Thornberg & Oguz, 2013) reveals that teacher participants in both countries identify similar sets of important values namely *relational values, self-responsibility values, self-enhancing values and democratic-participation values*. Significantly, "showing other people respect was the value most often referred to by both Swedish and Turkish teachers (Thornberg & Oguz, 2013, p. 52). An action research study in an Icelandic school (Sigurdardottir & Einarsdottir, 2016) finds that preschool teachers decide to emphasize three core values including *care, respect* and *discipline* because they believe that these are most effective in terms of children's social interaction.

Regarding values education methods, Halstead and Taylor (2000) suggest some common methods are direct instruction, the use of stories, discussion, just communities, circle time, extra-curricular activities, personal narratives, peer mediation and so forth. The cross-cultural research of Ghost and Tarrow (2003) identifies different methods which teachers use to teach values in Mexico, Canada and America. In Canada, methods such as role play, examples, case studies, critical thinking, autobiographies and visual media are used. Mexican teachers employ critical analysis, teacher modelling, values-focused teaching and teaching values through tacit curriculum. Discussion, cooperative learning, guest invitation and the use of visual media are frequent methods used in America.

Evidence from the recent values education research in Australia encourages teachers to use different approaches and methods in their classroom (Lovat, 2011, 2017; Lovat & Clement, 2008). Following that, the most effective values education methods are "values-explicit, student-centred and open-ended" (Australian Government, 2011, p. 6). Some of these methods are illustrated by good practices of different schools in Australia such as philosophy in the classroom, Socratic circles, student action teams and values action teams, students mentoring students, service learning, and information and communication technologies in values education (Australian Government, 2011).

In terms of values education assessment, Lovell (2006) introduces a social competencies test namely Monitoring Standards in Education (MSE) assessment in Western Australia including teacher observation, self-reporting and student response to particular scenarios. "Developmental scales identify where a student sits on a continuum ranging from seeing no problem in the scenario to showing compassion and valuing others" (Lovell, 2006, p. 2). Brady (2011) proposes some synthesis assessment tools depending on four common approaches to values education in Australia for teachers. Recent research of Notman (2012) in New Zealand found that the most preferred assessment methods of values education are observing student behaviours and student self-assessment.

3. BACKGROUND

The core values for Vietnamese citizens are identified transparently in the National Goal of Education: "To train Vietnamese in morality, health, knowledge, aesthetics and career; loyalty with the ideals of national independence and socialism; to form and nurture personality characters, abilities and qualities of citizens that can satisfy the mission of country's construction and protection" (SRV, 2005, p. 1). This is extended in Resolution No.29-NQ/TW of the National Plenum which identifies the need to enhance creative ability and potentiality of each individual to love family, people and country as well as to live well

and work efficiently (Ministry of Education and Training, 2014). Whereas these official government documents outline the goals of a comprehensive person fulfilled with both physical and mental wellbeing, they fail to address which specific values a Vietnamese citizen should attain and how to do that.

In Vietnamese general education, the subjects Moral Education and Citizenship Education are two main channels to transfer values explicitly in the compulsory curriculum. Nevertheless, these subjects' curriculum, textbooks, pedagogic methods, evaluation and results are criticized by the Vietnamese Ministry of Education and Training (Ministry of Education and Training, 2013). Although according to Nguyen, Nguyen, and Mac (1995) the Vietnamese educational aims, missions and demands performed in every activity of school are considered as a formal syllabus of personality and character education, a straightforward focus on values education studies to investigate the current values education perceptions and implementation seems to be absent. Moreover, in some places, values education is confused with the teaching of skills such as survival skills and self-protection skills in which the nature of educational purposes is very different.

In brief, values education cannot stand only on paper in the current context of Vietnamese schools. It needs adequate understanding, recognition of its important role, a suitable curriculum, efficient pedagogies and clear evaluation to enhance quality teaching and effective schooling. First and foremost, there is a need to investigate contemporary values education experiences at the classroom level where students and teachers work together and influence each other daily and directly. Then from these initial results other educational strategies will be identified to promote values in Vietnamese schools synchronically and effectively.

4. OBJECTIVES

The study explores the views of teachers and students in two upper secondary schools in Vietnam 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. Following that, four research questions are posed as follows:

- At school, what values are the most important to be taught and why?
- How are pedagogies employed to teach values implicitly and explicitly?
- How are the results of the values education process?
- What difficulties do teachers face in values education?

5. DESIGN AND METHODS

The study employed a qualitative case study research design to collect data in two upper secondary schools in Vietnam (school A and school B). While semi-structured interviews and observations were primary instruments used for teacher participants, focus group interviews were employed for student participants. 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 four groups of students (six students in each group) in grade twelve who participated in the focus group discussion are referred to as AG1, AG2, BG1 and BG2. Each focus group interview lasted around two hours. Regarding data collection from teachers, after observation of their classroom teaching, they were interviewed for approximately one and half hours. 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 quotes were selected to use in the research findings. The data was analyzed and written up descriptively and inductively based on the comparisons between two schools according to themes and between teacher participants and student participants (where this is appropriate).

6. FINDINGS

6.1. The most important values

6.1.1. School A

Five of eight teachers in school A and students in one group stated *honesty* was the most important value to transfer and promote at school because "*honesty* is a core value of a good person" (a student of AG1). Additionally, teachers 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 at 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.

> Every day, we have to finish a lot of homework. I think if someone can complete all, they must be a super star. Then some students just wait for copying other students' homework and these situations become a bad and popular habit in my class (a student of AG2)

Together with *honesty*, teachers and students shared the same ideas about two other values that should be taught at school – *respect* and *diligence*. Other values such as *self-esteem, creativeness and tolerance* were values that teachers appraised. This was different to students' selected values which included *independence, responsibility, politeness and fortitude*.

6.1.2. School B

Similar results were identified in school B. Half of the teachers, when asked about the most important values to teach at school, identified *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)

Interestingly, the reason for selecting *honesty* was almost identical between two schools in relevance to exam cheating problems. As a teacher's explanation, "If *honesty* was taught, exam cheating would be reduced. When students were honest, they would respect knowledge, science and research thereby improving their attitudes with study and exams" (Teacher 10). Another teacher revealed a sad reality in line with *honesty* and exam cheating.

> Sadly, now my students no longer believe in honesty. They think exam cheating does not matter but benefits themselves. So, why not? ... They just need good certificates to gain good jobs. (Teacher 14)

Students of school B also believed *honesty* should be imparted at school so as to "enhance learning attitudes of students because when they do not cheat at examinations, they have to learn hard to gain high academic results" (a student of BG2). Together with *honesty*, other important values mentioned by teachers were *respect, creativity, politeness, confidence* and Vietnamese traditional values including *patriotism*. Student group discussions included values such as *respect, independence, discipline,* and *responsibility*.

All in all, both teachers and students in school A and B thought that *honesty* is the most important value that should be imparted at school. The reason for this originated directly from exam cheating and indirectly from the heavy current curriculum and high-academic-results expectations of Vietnamese society. Apart from *honesty*, *respect, independence* and *creativity* were other important values mentioned.

6.2. 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.

6.2.1. The explicit methods

In both schools, teachers used a variety of explicit methods to teach values from traditional ways such as **questioning**, **the use of stories** and **direct discussion** to support use 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 said 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)

Although in school B teachers answered that they did not use **rebuke** or **punishment** in their classrooms, observations in some classrooms showed differently. Some teachers often rebuked their students during their teaching sessions.

6.2.2. 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 those involved perceive this or not. In both schools, all teachers and students agreed that the relationship between teachers and students could influence their teaching and learning in both 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)
> I will learn more effective if I love my teachers and vice versa. (a student of AG1)

Understanding that the relationships between teachers and students impacted on the efficiency of teaching and learning, both teacher and student participants proposed that they should have active ways to make good relationships with each other. The consensus seemed to be that they both tried to impress the other by carrying out their roles as best as possible.

> I try to concentrate seriously on their lessons and ask smart questions… I attempt to score higher marks. (a student of AG1)
> In each teaching period of any teacher, I always focus on what they teach and ask them some problems I do not know … Although some subjects are quite boring, but I still listen to them to show my respect. (a student of BG2)
> 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 spent time with them at break and after school time as they said, “I often play some games with my students at school playground” (Teacher 11) and “I am playing in a football team with my students” (Teacher 12). In the classroom, some teachers made a conscious effort at creating a 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)

Especially, teachers and students in school B emphasized ‘care’ as being the crucial element to improve teacher-student relationships. ‘Care’ meant that “teachers should ask students about their matters and show them that we are willing to help” (Teacher 11). Other teachers showed their care to students via praise and sympathy.

> In spite of sitting at the teacher’s table and talking, I often walk around the classroom and see my students’ work. When I see something they make interesting, I often praise them. Or even if their work is not quite good as a whole, I cheer them up by giving positive comments on their effort and the details of their work. (Teacher 13)
> I think we should sympathize with our students and discard their mistakes if we can. For instance, sometimes our students forget to do homework, I understand that they have to learn many subjects in a day long and they have so many things to pay attention to. Such understanding prevents me from rebuking or punishing them. (Teacher 14)

Similarly, students in school B said that they expressed their care to their teachers by “preparing some water bottles for our teachers .... When our teachers have new clothes, shoes or hair styles, we often complement. These tiny things make them happy and friendlier” (a student of BG2). Some teachers in both schools thought that they “should remind students about their positions. Teachers are not students’ peers or mates” (Teacher 16) and “teachers should keep a certain distance with students” (Teacher 10) because “when the gap between teachers and students disappears, students will not respect and listen to teachers” (Teacher 7). In contrast, students expected that their teachers would be “their friends, sisters or brothers who they were able to trust and share problems with” (a student of AG1). Students also believed that, when teachers kept a distance from students, they felt afraid of asking questions or expressing their opinions. Students also thought that friendship between teachers and students could enhance the quality of learning.

> If a teacher is friendly and easy, I feel free to ask them everything that I do not understand. When they are happy to answer my questions, I have a high motives to learn more. In the opposite case, even though I have a question, I do not dare to ask. (a student of BG1)
> I really want my teachers to be our friends. Between us does not have any barrier thereby improving our learning quality. Teachers are our friends does not mean that their positions are reduced. We still respect them … (a student of BG2)

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)

Several teachers believed that teacher modelling was the best pedagogic method and they often used themselves as examples for student behaviour:

> I want my students to be punctual, so I have never entered their classroom late. I teach my students about honesty, so I always do as I talk. I mean I have never told lie… (Teacher 14)
> If a teacher behaves properly and take care of students, their students will tell well about them with their parents. Then parents will take teachers as examples for their children to follow. I think the best pedagogy is using my behaviours and manners as examples to teach my students. (Teacher 10)

The positive character of teachers might impact students directly however, when teachers behaved badly, students were affected indirectly and they did not respect 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)

In the case of students, they felt that they respected and followed teachers who were always gentle, intelligent and sensitive as good models. Students said they loved teachers who could control their tempers and be calm in any circumstances.

> I wish that I will have good characters like my teacher. She is smart, well-behaved and delicate… I am impacted by my teacher who never lose her control and always be well-organized. These good values are useful for my work in the future. (a student of BG1)

Students also discussed that they were impressed by teachers who were different and 'strange' with special teaching methods. They took their Physics teacher as an instance, "when he taught us about a pendulum, he illustrated by a hanged person. It is so easy to remember his lessons" (a student of BG2).

6.3. 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 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 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 accept based on their own observations.

> The assessment of values education is quite subjectively so it is not exact. I just feel its results through students' cooperation and their communicative improvements. (Teacher 12)
> It is so hard to know the results of values education. We just observe through our students' behaviours and attitudes. (Teacher 13)

6.4. Difficulties in values education

First of all, lack of time was a serious obstacle that the teachers of both schools had to deal with. While time shortage in school A was related to the number of students in a classroom (around 48-50 students/classroom), in school B, time used for subject content and exercises.

> Some lessons contain lengthy unrealistic knowledge and we have to teach all of them. Certainly, my students get bored and they do not cooperate thereby the lessons seem to be longer. (Teacher 11)
> We just focus on teaching maths, we do not have time for values education. (Teacher 13)

This difficulty resulted from the expectations of the Vietnamese society and family where "the society and parents always require high academic results so we have to prioritize knowledge teaching and exercises" (Teacher 12).

Secondly, the lack of facilities for values education was another issue. As an example teacher 3 wanted to use a short video to integrate environmental protection awareness into her geography session but it was impossible.

> Our classrooms were not equipped with computers and projectors. If I want to use these tools, my students must move to a special room with projectors. When the students move out and in it takes round 10 minutes. (Teacher 3)

Thirdly, problems in values education included the 'special' students who challenged teachers' efforts and patience. Some teachers appeared to struggle in finding appropriate methods to response to these students.

> Each year I meet at least one student who makes me lose my patience! I do not know how to cope with them even I try my best. (Teacher 1)
> I am afraid of some students who keep talking and talking in my teaching sessions even I give warning to them many times. They bother their classmates and make me lose my teaching inspiration. (Teacher 3)

Fourthly, the complication of present society where young people face many pressures and pitfalls could be a barrier in teaching values as teacher 4 said: "not only teachers face difficulties in educating values but also our students. The conflicts of values taught at school and values received from society might upset our students". Finally, another difficulty in teaching values came from the lack of cooperation of students' family and the parenting methods of students' parents.

> 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)

7. DISCUSSION

The findings show that in both schools the majority of participants firstly identified *honesty* as the most important value that should be taught and then *respect*, *independence* and *creativity*. These results further support recent research conducted by Hawkes (2010), Thornberg and Oguz (2013), and Sigurdardottir and Einarsdottir (2016) in which *respect* and *honesty* are fundamental values of schooling. The reason 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. Additionally, other values related to the Vietnamese school context that should be considered and studied in more detail are c*reativity, confidence, diligence, discipline, fortitude, independence, politeness, responsibility, respect, self-esteem* and *tolerance.*

Teacher participants stated many different methods to teach values, however, they felt that they enacted values education without clear purpose and preparation in advance. Apparently, this is at odds with recent research in values education which argues that values education "cannot be left to chance or merely assigned to the hidden curriculum" (Lovat & Clement, 2008, p. 280). Values education needs to be planned and prepared carefully with the agreement of all stakeholders, especially the school leaders. 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 the importance of good relationships with their students and were willing to become their students' friends, some thought students might not respect them if they were too close. At this point, students' opinions contrasted with those of their teachers

as they expected that students and teachers should have closer relationships such as friendship, brotherhood or sisterhood. 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. This seems in accord with recent studies indicating that teacher modelling is the most favoured and effective strategy to teach values at school (Arthur, 2011; Lovat & Clement, 2008; Lovat et al., 2011; Lovat & Toomey, 2007; Lovat et al., 2009; Notman, 2012; Sanger & Osguthorpe, 2013).

The assessment of values education based on the number of times of school rules were broken seems both inappropriate and unsatisfactory. This contradicts the findings of Brady (2011) and Notman (2012) suggesting specific, suitable and planned assessment tools and methods for values education. 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 cause for major concern as most time was used for transferring knowledge of subjects. This requires changes on a national scale for the curriculum of the Vietnamese educational system. Other obstacles that should be taken into consideration are the dearth of educational facilities, tailored methods for special students, current social problems and parent cooperation.

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ACKNOWLEDGEMENTS

My great appreciation is sent to Dr Jill Brown, Faculty of Education, Monash University for her inspiration and training, and to Dr Danh Duc Nguyen, School of Educational Studies, Ho Chi Minh City University of Education for his encouragement and valuable support.

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Chapter #3

CURIOSITY AND STUDENTS' QUESTIONS IN THE TEACHING PROCESS

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ABSTRACT
Within the framework of teaching communication the attention of the researchers was focused on the problem of symmetry. Due to the complexity of the symmetry phenomenon in teaching communication the research was narrowed to student speech, i.e. to student questions. By considering the student question from different aspects the authors of this paper single out as important the number of questions asked by students during one teaching lesson as well as the types of questions asked as regards the presence or absence of students' curiosity. Therefore, the analysis of questions asked by students in teaching process during which students acquire new teaching contents, has also been singled out as a problem of research.
The goal of this research is to establish symmetry (or asymmetry) of teaching communication and to analyse the questions asked by students. The results showed the constancy of asymmetrical communication in the teaching process in almost all the teaching units observed, and the lack of students' questions, resulting from their lack of curiosity. Symmetry in communication and the largest number of questions arising from students' curiosity were seen in teaching units where the principles of integrated learning were applied.

Keywords: curiosity, student question, teaching process, symmetrical communication.

1. INTRODUCTION

One of the key starting questions in this paper is directed at the question of whether communication between the teacher and the students should be symmetrical. Symmetry in relations implies such a level of equality and responsibility of partners as for it to be reflected in the quality of the process and in the consequences it has for individual and for the community (Juul, & Jensen, 2010). Symmetry of communication implies that the subjects of communication have equal status and competences, but teaching communication clearly includes unequal subjects where one subject leads the other to the goal. In the teaching process it is most frequently the case of verbal domination of the teacher who leads the student to the realization of a teaching goal. Teacher's speech is one of the sources of knowledge and a tool of education. One of the answers to the key questions is: the teaching communication is asymmetrical. From this point of view, asymmetry can be justified by the nature of the pedagogical relationship which is in principle asymmetrical and which arises as a help and support for the students' development of their abilities (Bašić, 2015). The second answer to the key question takes as a theoretical frame the interactive context of occurences in the teaching process, and from that point of view the inequality of positions in the mentioned relationship is questionable (Peko, Varga, Mlinarević, Lukaš, & Munjiza, 2014). The traditional approach, which

implies for the teacher to teach knowledge, and for the students to retrieve it points to the necessity and justification of the asymmetry. The approach that perceives the student as an active individual taking part in the construction of the aimed knowledge, capabilities and abilities implies and demands symmetry. Regarding the width and scope of teaching communication, and the diagnostics of symmetry, i.e. asymmetry, in communication, the authors of this paper are directed at the diagnostics of symmetry exclusively by monitoring students' questions.

Some research clearly indicates the asymmetry of teaching communication and the fact that a student asks one question every third day (Langer, von Thun, & Tausch, 1974). In thirty per cent of teaching hours not a single student question was registered. Jurić (1974), studying students' questions in classes, showed that in teaching there is verbal domination on the part of the teacher. The asymmetrical form of this communication has also been shown in other empirical research, and the domination always relates to the teacher's speech, whilst the student's speaking activity is negligible (Peko et al, 2014). Therefore the students' speech in the form of questions has also become the research matter in the empirical part of this paper.

2. QUESTIONS IN THE TEACHING PROCESS AND DEVELOPMENT OF STUDENTS' CURIOSITY

Since there has been language there have been questions. They have always been a fundamental part of conversations between two communicating persons. Their role is as important today as it has always been, but today people find more and more ways to ask questions in order to examine the areas we are interested in, as precisely as possible in order to gain the desired answers, which are often found below the person's level of consciousness. Thus, questions are not only part of informal communication, but they become a powerful tool in realizing a variety of goals.

People begin asking questions at a very early age. Although there is no golden rule as to when a child begins to talk, in most cases it happens between 18 and 24 months of age. By their third year, children begin to speak and become increasingly interested in learning about the world around them. Children at this age ask about 200 questions a day, and from that age questions become an integral part of children's everyday interaction with the world around them.

The family, as children's primary social environment, offers a specific setting in which they feel free to ask questions. However, the family and school are separate entities in society, which on the basis of their own specific characteristics influence the development of curiosity and asking questions. The very processes of learning in the family and school environments differ significantly. Communication in the family setting is characterised by spontaneity, flexibility, close relationships and natural situations. Communication in the school setting is conditioned by the curriculum, the time table and the limited time for conversation. Problems are determined in advance, there is visible distance in the relationship with adults, and the child's role as a student is stressed. Therefore, the didactic value of questions in the learning process is conditioned by the setting in which they arise, that is, the teaching process.

Seen historically, the value of asking questions has been recognized since ancient times. Questions were the basis of Socrates' dialogue method, by which, with the use of irony and then maieutic teaching, using questions first led the students to contradiction and then gradually to new, constructive knowledge and opinions. Although today Socrates' method of conversation is traditional but also a teaching system that is part of history,

contemporary teaching systems, such as heuristic methods, problem or project teaching, also give the search for an answer an important place. Over the course of history, questions as such have been part of the considerations of many scientists, such as Vygotsky, who stated that the theory and practice of learning should be founded on the idea of learning as an interactive, social process, in which teachers and students create situations in which they learn from one another. The basis of the process would be communication, cooperation and feedback. The question, according to him, is the first sign of active thought, and a student's question is one of the more important indicators of the level of development of thought and speech (Vigotsky, 1978). Piaget (1968) also talks about the importance of questions in an analysis of moral education (Is it good or bad? Why did I do that? etc.) whilst Bloom (1956) founded their entire revised taxonomy of cognitive goals on the question, "What do we want to achieve by specific teaching?" and they categorized it in 6 levels. So the first level, "recall", is characterised by questions, through which we obtain from students' reproduction of the original form of content. The second level is interpretation, with a question which enables students to notice and link main ideas and describe the course of events or processes. The third level of questions is aimed at resolving problems in new situations, whilst the fourth level requires the student to analyse and separate information into its constituent parts, in order to establish causes and effects, to present evidence and conclusions, and support generalizations. The fifth level are questions which give the possibility of evaluating and a critical relationship towards facts. The last level are the questions which offer students the possibility of forming new ideas, concepts and solutions (Vizek-Vidović, Vlahović-Štetić, Rijavec, & Miljković,2003). In the Republic of Croatia, Jurić (1972) has dealt most with a pedagogic and didactic analysis of questions in the teaching process. His research confirms that students' questions contribute to intensifying and extending their knowledge, depending on the character of the teaching material, and that students most effectively use their intellectual potential when they subject the teaching materials to questions.

Today, studying questions in the teaching process has become marginalized in a way. Even research dealing with the issue of questions in teaching is mainly aimed at the actions of teachers and their dominant position in the teaching process, since still today the teaching process is defined with a major degree of asymmetry in the activities of the teacher and the students. This of course also relates to the process of asking questions. One of the first pieces of research dates back to as early as 1912, in which Steven (1912) states that a teacher in school asks about 400 questions daily. Kerry (1982) in his research stated that during the working day a teacher asks students about 1,000 questions. Research conducted in 2016 in the Republic of Croatia showed that teachers on average ask 82 questions during a lesson (Kolak, & Markić, 2017). These results, although they do not give an exact picture of the work of every teacher, clearly show that the trend has hardly changed at all. Also, type of questions asked during the teaching process is extremely important. The basic division is on the basis of:

- the way in which the questions are formulated: open and closed questions
- the direction of the questions: convergent and divergent questions
- the level of the thought process initiated by the questions, which is related to the revised taxonomy of cognitive aims of learning: questions of higher and lower orders.

More important than the number of questions asked by the teacher, of course, is the type of questions teachers ask their students. But here too the results are discouraging, and testify to the domination of closed and convergent questions, aimed solely at the level of recall of information, which do not offer students the opportunity for creative or critical

thinking. For instance, in the research by Pate and Bremer (1967) it is said that 69% of questions asked by a teacher relate to verifying knowledge and understanding of content, whilst only 10% are aimed at developing the students' opinions. The results from Kolak and Markić (2017) showed how the ratio between the teacher's convergent and divergent questions aimed at students was 1:8 in favour of convergent questions.

This domination of teacher's questions results in the impossibility of the students developing their own creative, reflexive, analytical and creative or critical thoughts. On the one hand, the teachers' reasons mentioned in research (Biddulph, & Car, 1992; Holt, 1982, Woodward, 1992, Watts, Alsop, Gould, & Walsh, 1997) are, for example, the teacher's inability to cope with a large number of questions, the lack of necessary knowledge, the lack of time, the focus on content and planned teaching, insecurity etc. All this may be manifest in the teaching process by ignoring, mocking, or disregarding students' questions, and similar undesirable but existing behaviour by students. On the other hand, the basic education policy documents (The Strategy for Education, Science and Technology, the National Curriculum Framework, laws etc.) explicitly and implicitly promote the principles on which the educational process should rest. The theoretical basis for promoting this educational and training philosophy is the theory of social constructivism. The postulates of social constructivism in the teaching process clearly emphasise the position of the student, where he/she becomes an explorer, who, with the support of the teacher, explores by him/herself and interprets his/her environment and constructs knowledge (Nacionalni okvirni kurikulum za predškolski odgoji i obrazovanje te opće obvezno i srednjoškolsko obrazovanje, 2011). In the light of this, one of the fundamental points of the National Curriculum Framework relates to the fact that the use must be ensured in the teaching process of various relevant sources of knowledge which promote the students' participation, observation, independent research, discovery, drawing conclusions and curiosity. Of all the above, curiosity is the initiator of activity which directs the teaching process towards the student. It is also the initiator of student questions, and therefore in this paper we will pay particular attention to it. The concept of curiosity was originally presented in psychological literature by William James long ago in 1890, when he defined it as one of the primary instincts of mankind. In this paper, curiosity as a need, a thirst and a wish for knowledge is regarded as one of the fundamental determinant of student's motivation. It is one of the fundamental concepts in motivation. Berlyne (1960) stated that curiosity is a motivational prerequisite for exploratory behaviour. The concept of curiosity therefore may be understood as a description of specific behaviour, and also as the hypothetical construct which explains that behaviour.

For the purposes of this study, the authors of this paper define student curiosity as the emotional reaction of a student as a response to a powerful cognitive, emotional and active need for knowledge, feelings and action, which is relieved by its realization. It occurs when a desire exists for a goal, which the student values as important. In the teaching process, this may be seen when a student wants to do something, achieve or realize something, and as a result begins to interact.

From a pedagogical point of view, the authors of this paper differentiate two basic types of curiosity in students: not feasible and feasible which reflect significantly on teaching process. Not feasible curiosity is characteristic of students who ask an extremely large number of questions and hinder the teacher in management of the teaching process. These students are most often too focused on themselves and are not able to cope with unfulfilled desires, even if they include the desire for knowledge. Such specific situations significantly undermine the teaching relationship, whereby the teacher, as a mature individual, has the task of achieving a pedagogic goal for the purpose of educating and

training the students, which mainly takes place on the basis of a directive from society. Feasible curiosity in students is related to activities within the teaching process and/or content of the lesson. To a competent teacher, the students' curiosity seen in this context becomes the starting point for planning the teaching process. Since students' curiosity, in a classroom where they are comfortable and secure, arises spontaneously and unforeseen, it requires from the one managing the teaching process a higher level of flexibility, and deviation from the originally planned form and course of the lesson. One of the mistakes that occurs in response to students' curiosity on the teacher's part is giving the student specific, prepared answers, instead of leading the student through a thought process in seeking the answer to the question asked. Loewenstein (1994) said that students' curiosity may be extinguished at the moment when the student becomes aware of the gap between what he/she knows and what he/she wants to know. The teacher should then pay particular attention to the workload he/she is imposing on the student since student's motivation diminishes if the task set is not a sufficient challenge or if the task is too difficult. Almost the same implication applies to students' curiosity in the teaching process. If the student is offered an appropriate dose of freedom and enabled to explore, his/her curiosity will be maintained, and in the end it will be the key motivator in achieving the desired goal. The research mentioned earlier by Loewenstein (1994) has strong implications for the didactic work of the teacher, especially bearing in mind the differences in the individual potential of curiosity in individual students. The individual level or potential of an individual's curiosity may be considered in two ways: The first is the one that defines the level of curiosity as an integral part of the individual's personality, and then we can talk about personality characteristics (exceptionally curious students). These students usually show signs of extrovertism and are bold in interaction, whilst others show signs of resignation or passivity. Passive students may have a need and be curious, but due to their own passivity, they do nothing to satisfy that need. The passivity of students may be caused by various factors, such as fear (of mockery by the teacher or students), previous negative experiences, insufficiently clear content, their status within the class (isolated, rejected) etc. There is then no feedback to the teacher, and curiosity in the teaching process is in the end most often extinguished. The other way is when curiosity is seen as an individual's condition which may be influenced. In the second case the need and necessity is emphasized for the teacher to possess pedagogic and diagnostic, or didactic and methodological competence to be able to plan, programme and manage the lesson, as part of the teaching process, in a way that arouses, recognizes and maintains the students' curiosity towards the content being taught. The students' behaviour, by which they clearly demonstrate their curiosity, may serve as feedback for the teacher. Maw and Maw (1964) listed the following student behaviours, by which the level of their curiosity may be recognized:

- they react positively to new, strange, incongruous or mysterious elements in their environment by moving toward them, by exploring them, or by manipulating them.
- they exhibit a need or a desire to know more about themselves and/or their environment.
- they scan their surroundings seeking new experiences.
- they persist in examining and exploring stimuli in order to know more about them.

From all the elements regarding curiosity that have been singled out in this paper the authors, in the empirical part, place a special focus on the students' questions through the analysis of presence or absence of students' curiosity.

3. METHOD

In dealing with the problem of symmetry of teaching communication, the problem of this research is closely directed at that part of teaching communication which analyses the questions asked by students during the teaching process at the teaching lessons aimed at acquiring new teaching contents. It is expected that the students are most open for asking questions in those teaching lessons that aim at acquiring new teaching contents. The goal of this investigation is to determine the symmetry (or asymmetry) of teaching communication, and to analyse students' questions on the basis of the criteria mentioned in the introductory considerations of this paper.

From the aim of the research two specific research questions emerged:

1. Does the number of questions asked by students confirm the symmetry of teaching communication?
2. Does classroom communication encourage the students' curiosity by asking questions?

The sample for analysis comprises teachers (N=5) and their students (N=124). The elements for analysis of teaching comprise video recordings of lessons in a time sequence of teaching units when new teaching content is being learned.

In formation of the sample, the principle of voluntary consent of the teacher was the critical criterion. The age of the students was in the range from ten years 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 teacher's free choice, and in the sample it ranged from a dominant, frontal form of work, then a combination of frontal and group work, strong use of group work in guided exploratory 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.

STRUCTURAL ANALYSIS OF LESSONS - THE SAMPLE					
Teaching situation observed	**Class**	**Teaching subject**	**Dominant form of work**	**Type of lesson**	**No. of students**
Teaching situation 1	*5*	*Mother tongue*	*Frontal*	*Learning new teaching content*	*19*
Teaching situation 2	*5*	*Biology*	*Group work*	*Learning new teaching content*	*25*
Teaching situation 3	*6*	*Geography*	*Group work*	*Learning new teaching content*	*30*
Teaching situation 4	*4*	*Class teaching*	*Integrated learning*	*Learning new teaching content*	*22*
Teaching situation 5	*4*	*Class teaching*	*Frontal/group*	*Learning new teaching content*	*28*

4. RESULTS AND INTERPRETATION OF THE RESULTS

In the search for an answer to the first research question, teaching situations, focusing on the teacher's speech and the students' speech were considered. In reply to the research question set, we were helped by the number of questions asked in the observed lesson, and their ratio (teacher's questions in relation to students' questions). In the speech of the teacher and the students focus was exclusively on the questions asked by the teachers and the students in communication during the lesson. Questions are expressed in terms of frequencies, and on the basis of the proportion of questions asked, the level of symmetry was established, which in this research was in a range from extreme asymmetry (ratio 1:20), asymmetry (1:7; 1:4.5) to symmetry (1:1.4; 1:1.8).

Table 2.
Answers to the first research question.

ESTABLISHING THE SYMMETRY OF TEACHING COMMUNICATION BY MEANS OF THE QUANTITY OF QUESTIONS			
Teaching situation observed	**Teacher's questions**	**Students' questions**	**Degree of symmetry of teaching communication**
Teaching situation 1	*103*	*5*	*Extremely asymmetrical*
Teaching situation 2	*77*	*17*	*Asymmetrical*
Teaching situation 3	*41*	*22*	*Symmetrical*
Teaching situation 4	*28*	*20*	*Symmetrical*
Teaching situation 5	*58*	*8*	*Asymmetrical*

Examination of the results of the research shows 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 the lack of clarity in the instructions the teacher gave to the students. By insight into this teaching lesson one can confirm the implicit pedagogy of the teacher who would define this pedagogic relationship as asymmetrical, whereas at cognizing new teaching contents the teacher’s speech would be singled out as the most secure way to reaching the goal. The analysis of this teaching lesson points to the importance of education content and to the diminishing of the student’s activity and speech. Similar results were achieved by Ritz-Frolich (1973) who established the teacher’s large verbal participation in the teaching process, i.e. that the teacher is verbally active during two thirds of the monitored teaching time. These results have also been confirmed by Vukanović (1980) and Grubišić-Peko (1988) who have established the dominance of the teacher’s verbal activity, although they monitored it in different teaching areas, which is also the case in the sample of this research. They also found out that students’ activity was negligible, and that the monitored teaching process most frequently followed the asymmetric form: the teacher speaks, while the students listen, or there is interaction between the teacher and one student. Peko, Mlinarević, and Gajger (2008) report the results of the protocol of frequencies by which they noticed the questions of teachers

and students which confirmed the asymmetry ratio of 40:11 in the fourth year of schooling, and of 35:7 in the sixth year, in both cases in favour of the teacher.

Symmetry in teaching communication in Teaching situation 4 is diagnosed and partial symmetry in Teaching situation 3. In view of the fact that Teaching situation 4 was the only one to use the principles of integrated teaching, it may be assumed that integrated teaching encourages symmetrical communication. The spatial and social factors of integrated teaching significantly contribute to symmetrical communication, because it can be applied even in relation to the students' movement. Students' movement around the classroom was equally present as the teacher's movement, in contrast to Teaching situation 1, where the teacher moved around 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, the emotional reaction of fear in students when asking questions, and an analysis of teachers' speech (time and content).

Table 3.
Answers to the second research question.

STUDENTS' QUESTIONS AND CURIOSITY			
Teaching situation observed	∑	**Z**	**Description**
Teaching situation 1	*5*	*0*	*None of the questions was an expression of the students' interest. All questions were focused on a lack of clarity in following the teacher's instructions or seeking permission for a certain activity.*
Teaching situation 2	*17*	*1*	*Only one question was an expression of the student's curiosity as the result of lack of clarity in the teaching content*
Teaching situation 3	*22*	*4*	*The students' questions were the result of the teacher encouraging the students' curiosity*
Teaching situation 4	*20*	*8*	*The students asked questions in their activities which were the product of their curiosity. The content of the teaching unit was suitable for their interest/curiosity (The central topic of integrated learning: "If trees could walk").*
Teaching situation 5	*8*	*1*	*The student's interested question was an expression of the student's personality.*

∑ Total number of students' questions in the teaching situation observed
Z - The number of questions which are an expression of the students' interest related to the content

The students' interest is an excellent indicator of the students' position in the lesson. It relates to the answer about whether the students' 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 in the lesson. If our aim is for students to develop into capable, active and responsible individuals, their position in the classroom is important. By responding to the students' needs related to their desire for knowledge, we aim the lesson at the students and bring them into an active position. A student's curiosity, formulated as a question, has a very small part in the observed sample. It is most visible in the teaching situation aimed at integrated teaching. In the practice of integrated teaching there are attempts at realizing constructivist principles which are manifested in the work directed at the student, based on sensation and experience, on linking various areas and sources of knowledge, on interaction, communication and cooperation, on respecting

democratic values, in the work which is accompanied by pondering upon the achieved goals, which is challenging, founded on reflective and contemplative processes, on the knowledge that is being enriched with new experiences and applied in an authentic manner (Čudina-Obradović, & Brajković, 2009).

The authors of this paper assess that the very content of that teaching unit was suitable for developing interest and that the implicit teaching method of the teacher running the class was aimed at encouraging and developing the students' interest. In that class, the atmosphere itself was assessed as being stimulating, pleasant and relaxing. Education through responsibility and not obedience was visible. In the third teaching situation the students' questions arose only as a response to stimulation on the part of the teacher and were not a sign of the students' curiosity. The authors of this paper presume that students' curiosity intensifies when working in pairs and in group work. In the remaining teaching situations, the students' curiosity was completely or almost completely lacking. The students had a visibly passive role and relationship where the teacher taught and the students were taught. Similar results have also been reached by Peko, Mlinarević, and Gajger (2008) who, by analysing the contents of questions put to students, have demonstrated that the majority of the questions put by students to teachers are not connected with the teaching contents nor are they the products of students' curiosity, but are rather related to permitting the students perform certain activities or check if they have understood the given tasks.

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 pedagogics of educational workers and their connection with symmetry in teaching communication.

5. CONCLUSION

The results of this research show the asymmetry in teaching communication. It is 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 indicates passivity. Teacher-led activities leave little room for the opportunity for self-construction of knowledge by the students, or a desire for knowledge which goes beyond the framework of the given school curriculum. The teacher's feeling of responsibility is also visible, to respond to the requirements of society and "pass on" the teaching content to the students (sociocentristic approach), along with the teachers' lack of freedom and autonomy to help students in construction of knowledge, and in so doing to focus on the student and not the content (pedocentristic approach). The focus on the content and achievement puts an end to the development of the students' curiosity. Students' curiosity gives rise to a feeling of insecurity in the teacher in managing the teaching process, because changing the planned lesson requires a higher level of teacher competence.

From the results of the research we may point out some factors that could have influence on students' curiosity like the teaching methods and social forms of work, which may contribute to either stimulating or smothering it. This research was undertaken in different subject areas but the 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 pedagogics of educational workers. The authors of this paper uphold the suggestion of authors who point out the great importance of pedagogic questions and pedagogic answers in the process of raising the quality of the teaching process (Bowker, 2010).

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Chapter #4

THE IMPACT OF INTELLECTUAL CREATIVITY SKILLS ON MATHEMATICS

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ABSTRACT
Creativity may be defined in the most general sense as producing different solution strategies apart from ordinary solutions when individuals encounter with a problem. The production process of such solutions should be designed with original ideas, which are sufficiently flexible and fluent. The aim of the research is to identify the methods used by mathematics teachers for the formation and development of creative, analytical and probabilistic thinking skills of students by taking both student and teacher views into consideration. In this context, it has been conducted in order to reveal the environments prepared, the methods applied and the assessment made by the teachers. The research was conducted in 2015-2016 at two public schools (colleges) which students can enrol after passing entrance examinations. The study group of the research consisted of 8 mathematics teachers and 8 college students randomly chosen from the public schools. Eight teachers and eight students determined by the convenience sampling method formed the sample of the research. Semi-structured interview forms containing open-ended questions were used as a data collection tool. In line with the results obtained from the research, it has been observed that the collected data support the views of teachers and students.

Keywords: creative or (intellectual creativity) thinking, analytic thinking, connective thinking ability, mathematics.

1. INTRODUCTION

The importance of mathematics in today's world is increasing day by day, as it is one of the important tools we use to solve the problems in our everyday life. Mathematics is important because it enables individuals to solve problems that individuals may encounter in daily life (Yenilmez, & Uygan, 2010). Therefore, the target behaviours, in other words, outcomes in mathematics, which students should obtain, are included in all curricula from the beginning of the school life to the university (Baykul, 2009). Different meanings can be imposed on the word 'problem' in mathematics education. Generally speaking, the problems are considered as unknown and the solution is not obvious (Haghverdi, Semnani, & Seifi, 2015). In such questions, it can be said that students can reach a solution by reasoning with their existing knowledge. Therefore, this study emphasizes that the necessity of acquiring advanced level thinking skills as well as analytical, creative and probabilistic thinking skills are important.

Creativity is thought to continue without losing its importance from the past to the present day, Dziedziewicz and his colleagues (2014) conducted a study to show the development of products that made our lives easier, and these have been regarded as new ideas, objects or concepts. It is also emphasized that mathematics is important at the level of creativity from the view of the universe being lived in, along with the perspectives of individuals, and that their ideas change in different forms (Sriraman, Haavold, & Lee 2013).

It can be said that it is necessary to teach not only creative thinking skills but also creative thinking. Dikici and Soh (2015) also seemed to be particularly interested in the students' ability to acquire creative thinking skills and discussed in their study it should be used as a tool in education so as to develop education.

Thus, in order to enable students to learn to think creatively in their mathematics lessons, teachers need to pay attention to their attitudes and movements in the classroom. It is important for the students at the level of collaborative learning to have different motivations for creating different ideas by assuming the role of the teacher as a guide (Karataş & Özcan, 2015). Likewise, Ekici (2016), for example, highlighted in his study that students should have the opportunity to solve a problem in the classroom, the necessary and right time should be provided to support them, they should be encouraged with prizes, and they should have the right environment to create different ideas, to work in cooperation and to act in a cooperative manner.

Roberts (2002) notes that creativity exists in every individual, but appears earlier in some depending on the frequency of exercises.

According to Ersoy and Başar (2009), creative thinking ability can be defined as the ability of the individual:

a) to be fluent
b) to think flexibly
c) to detail
d) to be original
e) to be able to diversify
f) to be able to identify the problem
g) to be able to visualize

Cognitive processes that are linked to problem solving and to be able to solve problems are important to creativity (Korkmaz & Gur, 2016). In this context, it should be emphasized that it is necessary for the individuals to deal with methods that are much newer, more current and unconventional than the traditional. There is also a need to look at how useful and effective new methods designed and these should be measured and evaluated (Sriraman et al., 2013).

Similarly, Sriraman (2004) revealed in his study that mathematical creativity could be examined in five dimensions, which are social interaction, heuristics, intuition, proof, and facts. At this point, teachers with creative thinking skills will need sufficient background knowledge and new activities to transfer them (Sæbø, McCammon, & O'Farrell, 2006). Therefore, first of all, it is important to train teachers who can think and then to train them to transfer creative thinking to their students.

This study is important as it includes creative teaching activities, teachers' creative thinking ability at a sufficient level and the ability to teach this to their students. Therefore, the methods which students and teachers can develop together with the aim of developing creative thinking methods should be aimed instead of the techniques used in the past.

It can be said that in addition to the increasing importance of knowledge today, the steps that will take place in our minds at the stage of obtaining information are important. Problem solving is considered to be important because the imaginary part of the human brain representing the right lobe and the part representing the left lobe are thought to consist of concepts called analytical thinking (Lumsdaine & Lumsdaine, 1995).

It is thought that creative thinking in the field of mathematics can be achieved more integrally with students by using problem solving and analytical thinking skills together. In this context, Sternberg (2006) described analytical thinking as the ability:

a) To separate a problem into parts and to make sense of these parts,

b) To explain the functioning of a system, the reasons for something to happen, or the steps to solve a problem,

c) To compare two or more cases,

d) To evaluate and criticize the properties of something

As can be seen from this classification, comparisons can be said to be an integral part of analytical thinking.

According to Ruskin (2011), analytic thinking is often associated with thinking by focusing on a specific goal, in other words, problem solving, researching the truth, developing understanding. Briefly, analytical thinking can be viewed as a study of a small number of studies that focus on solutions and can see the whole.

According to Cottrell (2008), analytical thinking is "weighing up the arguments and evidence for and against".

In its base it includes three elements, which are;

a) To think carefully and over on a topic,

b) To evaluate the evidence set forth to support the views or perspectives,

c) To assess the point where the point of view reaches (what conclusions can be drawn from them, are these conclusions reasonable and logical, if not, should this belief and perspective be reassessed?).

Analytical thinking involves the whole process of fragmentation, redefinition and classification. It is a way of thinking based on analysis. It divides the concrete problems of nature into small pieces and collects information (logical functional vs. links) from the characteristics of the parts. It links the data and events. It also defines the basic relationships between them, examines complex relationships.

Analytical thinking can be defined as a cognitive activity in which mental functions are used. From this point of view, we can think of analytical thinking as a set of processes in which a set of mental processes, such as attention, memory, reasoning, perception and inference, interact in coordination. Critical and analytic thinking such as selection, categorization, induction, deduction, metaphor, analogy, decomposition and abstraction are the other components of such thinking styles.

Probabilistic thinking is the ability to think of all possibilities of an event or hypothesis at all stages from the beginning to the conclusion (Acar, Tola, Karaçam, & Bilgin, 2016).

According to Çuhadaroğlu (2013) described the probabilistic thinking ability of an individual as:

a) the tabulation of data

b) the interpretation of the graphics

c) the ability to think about all possible aspects of flexibility

It may be said that when an individual encounters unexpected situations, he needs flexibility to find a solution by being able to courageous enough to avoid the uncertainty that exists, but he also needs ability to think reasonably to be able to judge possible solutions. It can also be said that probabilistic thinking is further than correlational thinking. The ability of a student to evaluate events symbolizes that the individual has developed a combination logic basis. At the same time, with probabilistic thinking, it is also possible that the individual can associate four probabilities in his mind, can eliminate the ones that are not suitable, or even keep one of them and make the other ones variable.

For example, asking students to think that they have 6 balloons in their hands and to find how many different ways there are to blow up these balloons in 3 shots at most will help the students to try all possible ways of thinking.

Lawson (1978) emphasizes that all extrinsic reasoning involving probable thinking skills is related to the content of science education in determining variables and relationships. In particular, information presented in the form of problem situations has a positive impact on the development of students' relational and probabilistic thinking skills (Brickell, Ferry, & Harper, 2002).

It is thought that one of the most important stages of dissemination of thinking skills in education is teacher training. Firstly, teachers need to acquire thinking skills and apply it to their real life. Once teachers have gained these skills, they can make their students develop their own skills (Köse, Ercoşkun, & Balcı, 2016). For this reason, making teachers' gain thinking skills is an important step in educational activities. Some specific teacher behaviours influence student achievement, self-esteem, social relations, and ability to think. It is also stated that teacher's work or sayings in class can greatly influence the thinking skills of students. Kentmen and Çağanağa (2015) argue that creativity can also be gained through the materials that teachers develop. Therefore, there are a number of issues that teachers should pay attention while teaching creativity. First of all, it is important that while teaching creativity in the classroom students should be supported and encouraged to produce different solutions while solving problems (Karataş & Özcan, 2015). When questions or problems are directed to the students, time will be given to them to produce different solutions so as to encourage them to be creative by concentrating and supporting them (Korkmaz & Gür, 2016). On the other hand, it should be conveyed to the students that a problem has a single answer but that it can be obtained in different ways. For example, the substitution or the destruction method can be used to find the solution, which is the only answer in the systems of equations in the 8th grade mathematics curriculum. To reach the solution, the right time and asking the right questions are also important. For example, when a question about how to solve a problem during a lesson is asked, they should first be given time to do so, and then share their solution with their friends, asking them why they chose this method and what steps they followed. It is important for the teachers to show the ways of solving the questions, to explain the way they follow along with their steps and reasons.

Teachers should aim for the development of their students' skills as well as the ability to improve their diversity by showing the solutions in a short and easy way. Thus, categorizing ideas to be created and solutions that are put forward in an original form, should be appreciated (Çepni, Ayas, Johnson, & Turgut, 1997). Likewise, Mrayyan (2016) stated that there are five different methods, namely expansion, analysis, change, re-implementation, management and the factors hinder creativity, which are developed to reach more effective results while teaching creative thinking. With these methods, it is tried to be conveyed that every problem can be solved with appropriate strategies as a result of thinking. It is also emphasized that new discoveries can be made by associating existing information with the problems that require multiple processes. Even though there is more than one way to solve these problems with these methods, it is possible to eliminate the ambiguity by indicating why teachers use the solution that they prefer to use.

In this context, it is aimed to investigate how the thinking skills can be taught to students by taking the views of both students and teachers and what can be done especially in teacher dimension.

2. METHOD

In order to develop creative, analytical and probabilistic thinking skills of students, it is aimed to determine the methods used by mathematics teachers by taking the views of both students and teachers. In the 2015-2016 academic year, this study conducted in two schools (colleges), which offer places to students with a special examination done by the Ministry of National Education. It was carried out with qualitative research methods and case study was applied. The case was considered as a rich content discourse or interpretation that gave the opportunity to support the obtained data with scientific findings (Yaman, 2010). In the selection of samples of such patterns, "snowball", "convenience sampling methods" can be used. The sample size should generally be around 10 (Yıldırım & Şimşek, 2005). Therefore, it is important that the sample should be formed from people, events, objects or situations that have the qualities determined in relation to the problem in the researches that have taken the convenience sampling method (Büyüköztürk et al., 2009).

By using convenience-sampling method, 8 mathematics teachers were randomly selected from the schools related to the Ministry of National Education and their competence and attitudes about their thinking skills and the ability to develop creative thinking skills of their students were taken into consideration. Convenience sampling is defined as the inclusion of the number of subjects that can be reached from the target group during the study (Cohen, Manion, & Morrison, 2006).

2.1. Data collections tool

The interview method was used as a means of collecting data in order to find out what kind of environment the teachers prepared for their students, what kind of methods they applied and how they evaluated. The semi-structured interview technique was used because it allows the participants to be more comfortable and to gather more detailed information about the subject (Elma & Bütün, 2015). The data were collected through semi-structured interview forms consisting of open-ended questions, which were prepared by researchers.

The questions in the interview forms for the teachers are:

1) What are your views on being able to think analytically / probabilistic / creative and to teach these ways of thinking?

2) What are the methods that should be used to think analytically / probabilistic / creative?

3) What should be done to teach analytical / probabilistic / creative thinking?

The questions in the interview forms for the students are;

1) What are your views on being able to think analytically / probabilistic / creative and to learn these ways of thinking?

2) What are the methods that should be used to think analytically / probabilistic / creative?

3) What should be done to learn how to think analytically / probabilistic / creative?

1 of these questions is about creativity / analytical / probabilistic thinking skills, 2 is about teaching dimensions.

2.2. Data analyses

In order to analyse the obtained data in the research, themes were formed in accordance with the views given by the mathematics teachers using content analysis. In content analysis, there are four stages: processing of qualitative research data obtained from documents, coding of data, finding of themes, regulation of codes and themes, identification and interpretation of findings (Yıldırım & Şimşek, 2008).

3. FINDINGS AND DISCUSSION

In this part of the research, findings obtained from the interview forms applied to the teachers and students were discussed.

In the study, 3 questions were asked to the teachers and the data obtained from the answers were explained below with the theme, code, frequency and percentage distributions. In addition, some of the comments made by the teachers were also included and the related subject was emphasized.

Table1.
Teacher views.

Theme	Code	f	%
Analytical / probabilistic / creative Ideas for teaching thinking styles	Problems arising from basic education prevent such thinking	1	12,5
	Student profile differences in the class are problematic	3	37,5
	It is necessary to support it with visual materials	1	12,5
	Creating multiple solution ways of pre-gained information is required	2	25
	The necessity of determining appropriate strategies for solution ways	1	12,5
Methods to improve analytical / probabilistic / creative thinking	Group work	2	25
	Brainstorming	1	12,5
	Mind Mapping	1	12,5
	Learning by doing-by living	1	12,5
	Mathematical Project	2	25
	Problem solving Strategies	1	12,5
What to do to teach analytical / probabilistic / creative thinking	Using Material	2	25
	Daily Life Examples	2	25
	Discussion environments	2	25
	Making learners read crime and murder novels	1	12,5
	Taking the advantage of games that require creative thinking	1	12,5

As can be seen in the table, 12.5% of the teachers said that the curriculum of the schools had an obstacle to the basic education in primary education while teaching creative/ probabilistic/ analytical thinking skills while 37.5% of them thought that they were having problems with the student profile. Some of the teachers 12,5% of whom stated that they could use visual materials in order to teach them in their lessons, said there was not any

teaching like this and it was not included in their curriculum. The aim of modern human education is to educate people who are able to solve problems, use mathematics in daily life, gain analytical and probabilistic thinking skills and keep alive the need for learning information (Craft, 2014). Teachers have important tasks when students acquire these skills. In North Cyprus, it is observed that predicting different events are included only in the curriculum-based probability learning category, and that there are also contingent probabilities (Özreçberoğlu & Çağanağa, 2016).

It is seen that 25% of the teachers stated that such thinking skills were used with pre - acquired knowledge of students so they created more than one solution and 12.5% of them were effective in determining the strategy. It was also evident that these teachers contributed to the teaching of thinking skills when creating suitable environments for elimination of traditional methods in class. Dewey (2007) indicated that analytical thinking skills were needed to gain in the process of resolving non-specific situations, while logical thinking was an element that was required in both problem-solving and analytical thinking.

In addition, the participant's comment on the subject is remarkable.

"*It is necessary to develop the thinking skills that can produce alternative solutions by systematically using different strategies when there is a problem so the person can bring to their own proposals and propose unique solutions by using the pre-existing information.*" (Participant 3)

In order to be able to think creatively / probabilistic / analytically, it appears that teachers have been using and implementing strategies such as group work, brain storming, mind mapping, doing-by-life learning, mathematical project and problem solving strategies. A number of studies showed that information presented as problems had a positive effect on the development of relational, composite and probabilistic thinking skills of students (Brickell, Ferry, & Harper, 2002).

Here are just a few of the participants' comments on this;

"*It is important to restructure a realistic education system where the learning-by-living model can be applied more.*" (Participant 3).

It was seen that Yurtbakan and his colleagues (2016) also included practical activities for learning by doing among the preferred methods to increase the achievement in mathematics in their studies.

"*The method of question-answer, brainstorming, Gordon's method, mind maps, metaphorical thinking techniques and group work must be the methods that can be used because different ideas can be exchanged.*" (Participant 2)

In order to teach teachers to think creatively / probabilistic / analytical, it was suggested that more materials should be given to the students using daily materials as examples, debates should be made by gathering controversial ideas, teachers should have students read crime and police investigation novels, and games should be played for creative thinking. In addition, classroom communication should be supported by motivational words or praises and clear and understandable instructions should be given (Cremin, Burnard, & Craft, 2006).

The remarkable words of the participant on this are stated as follows.

"*Students should be made to read crime novels that can teach these kinds of thoughts and learn different ways of solving such as crime and murder which I believe will help them to develop themselves in their Daily life as well as to bring abstract thoughts in order to approach the events with different perspectives*"(Participant 7).

In the study, 3 questions were asked to the students as well as to the teachers and the data obtained from the answers were explained below with the theme, code, frequency and percentage distributions. In addition, a few comments made by students were stated.

Table 2.
Student views.

Theme	Code	f	%
Ideas for teaching analytical / probabilistic / creative Thinking styles	The necessity of acquiring different perspectives for maintaining permanence	2	25
	Creating discussion environments for individuals to develop their interpretation power by taking individual differences into consideration	3	37,5
	Using application courses besides teaching theoretical knowledge	3	37,5
Methods to improve analytical / probabilistic / creative thinking	Group Work	4	50
	Question and answer method	2	25
	Development of different solution ways by inquiry method	2	25
What to do to learn to think analytically / probabilistic / creative	Being curious, being innovative	1	12,5
	To be able to come up with different solutions	3	37,5
	Creating questions	2	25
	To be able to interpret solutions	2	25

As can be seen in the table, 25% of the students about learning creative / probabilistic / analytical thinking skills pointed to the necessity of gaining different perspectives to ensure persistence. 37.5 % of the students pointed out the necessity of creating controversial environments in which individuals develop their interpretation power by taking individual differences into account and 37.5% of them revealed that practical lessons should also be included with theoretical knowledge.

The participants' comment about this is remarkable.

"*Learning these thinking skills that will contribute to the development of our intelligence and our interpretation by ignoring the individual differences in the classroom will ensure the permanence of different solutions*" (Participant 1)

Fletcher (2011) noted that individual differences needed being addressed by supporting diversity in order to enable students to think creatively in their work. The students who emphasized that practice should be included in the process of teaching them in these contexts, also indicated that these thoughts were not only able to reach the best solution but also improve their characters.

Regarding this, the participant emphasized it with the following explanation.

"*These thinking skills that are practiced during the lessons, and even if it is necessary, statistic teachers teaching us once or twice a week for these lessons, will enable us to look at events up to date. Thus, it will not only provide different solutions but also it will contribute to our character to develop.* "(Participant 6)

Erbaş and colleagues (2014) pointed out that using the using the applied modelling from the modelling approaches, students can gain the ability of problem solving and modelling.

It was explored that 50% of the students paid attention to the group work for the methods that could develop creative / probabilistic / analytical thinking, 25% to the question-answer methods and 25% to the opportunity to reach different ways of solution by using the questioning method. Thus, it is considered that making comparisons of the

different solutions and the ways to the solutions will affect the development of the students' interpretation and visual skills.

The participant said the following words about the subject concerned.

"Time should be given for the solution of the questions. During this period, we should be asked to explain our thoughts about the solution steps and after being given clues about the solution to question. "(Participant 8)

Mrayyan (2016) also emphasized that while learning creative thinking, new ideas were obtained in the order of steps and also that it was important for the students to be guided by asking the right questions for analytical thinking skills. It is also evident that some students should be encouraged to acquire and learn these thinking skills. Similarly, Cremin et al. (2006) showed in their study that encouraging in the teaching of thinking skills such as creativity played an important role.

In order to learn these thinking styles, 12.5% of the students expressed opinions about being open to new ways, 37.5% able to derive different solutions, 25% to create question types and 25% to interpret the steps used to solve the questions.

The words of the participant are as follows.

"It is important to be supported to increase our courage while trying to find different solutions" (Participant 2).

4. CONCLUSION AND RECOMMENDATIONS

In many countries, it is known that the education systems based on problem solving are renewed according to changing and developing conditions in order to achieve the highest level of education (Tataroğlu, 2009). This research compared teacher and student views about gaining high thinking skills that will support students' ability to cope with the uncertainties that will be encountered in real life. In the direction of the results obtained from the research, it was seen that the collected views of the both teachers and students were supportive for each other. It was concluded that teachers were partially informed about the teaching of creative / probabilistic / analytical thinking skills in general, but that they do not have sufficient knowledge to teach it, however, they have theoretical knowledge in teaching methods. In addition, teachers stated that they are trying to use teaching techniques obtained from pedagogical courses. Students suggested that learning these thinking skills would not only contribute greatly to them but also would help them to develop as an individual not only in terms of teaching but also in society. The result of high-level thinking skills which are aimed to be acquired after obtaining student and teacher's views can be realized by the development of new solution ways and group workings with the active student participation in the active classroom environment.

4.1. Recommendations

Firstly, the teaching of creative / probabilistic / analytical thinking skills should be used not only only during the course but also outside the course. For this purpose, it is suggested that new methods and teaching techniques should be developed and implemented. Also, it is suggested that in-service seminars should be given in order to teach the new methods to be taught and developed.

In addition, it is recommended that teachers should design materials in order to make the lesson interesting and provide a sense of remembrance. It is important that both sides are encouraged so that not only the students but also the teachers can be motivated. For this reason, teachers should pay attention not only to their speech but also their behaviour. In addition to these, it may be advisable to analyse teacher performances. While presenting the

questions, visual presentations and technologies should be utilized. In addition, students' classroom seat order should be changeable. Lesson attendance should be ensured with the help of games. It should be taught that only risk should be taken, force should not be applied. By adopting the view that there is more than one solution to a problem, it is expected that they should develop solutions to find the maximum ways to solve the given questions. Sufficient time should be given. The questions should be solved step by step and the students should be given the opportunity to establish the link between the transitions and to improve their ability to make comments by asking about the cause-and-effect relationships. Routing tips should be used to answer questions. Problems should be solved in the classroom. They should be able to develop hypotheses and discuss them. At the time of the examination, the student may be asked to write a new question and solve it, considering his / her own view. Thus, the use of probabilistic and creative thinking skills will be supported since students will be able to guess by abstract thinking and giving key concepts. While the choice of questions is linked to problems in everyday life, the readiness levels of students should not be ignored.

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Section 2
Projects and Trends

Chapter #5

MOTHERS OF SPECIAL NEEDS CHILDREN, COPING STYLES AND EDUCATIONAL INVOLVEMENT

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ABSTRACT
The purpose of this study was to examine the effects of stress and coping style with stress among mothers of children with special needs on their involvement in the school. The findings indicate that an emotional coping style predicts a high level of stress among all mothers. Comparing mothers of children with special needs with mothers of normally-developing children, higher levels of stress were found among the former. However, this difference was not reflected in the involvement at the school which did not differ between the two groups. Moreover, it was found that mothers of children with special needs make more use of a social support coping style. The findings contribute to the investigation of predictive factors of parental stress and parental involvement in children's education.

Keywords: mainstreaming special needs children, parental involvement, stress, coping styles.

1. INTRODUCTION

A child with special needs is a child with disabilities preventing him/her from utilizing regular educational services provided to his/her peers in their residential region (Meijer, 1999). The special needs children population includes a great variety of disabilities/difficulties - physical, mental, emotional-behavioral, sensory, and cognitive or language disabilities, or comprehensive developmental disabilities (Nicpon, Allmon, Sieck, & Stinson, 2011; Ministry of Education of Israel, 2009). Moreover, in most Western European countries, as well as in Israel, there is a tendency to integrate special needs children in regular education (Blue-Banning, Summers, Frankland, Nelson, & Beegle, 2004; Naon, Milstein, & Marom, 2011).

Many parents raising special needs children cope successfully, demonstrating high levels of satisfaction with their lives. However, there is much evidence that this special type of parenting is accompanied by difficulties and high levels of stress and frustration as well as health and mental welfare issues (Dervishaliaj, 2013; Feldman, 2007). Caring for special needs children causes chronic fatigue (Giallo, Wood, Jellett, & Porter, 2013); harm to the parents' social life (Heiman, 2002); possible injury to the family's economic status due to the parents' need to miss work (Carroll, 2013; Deringe, 2012; Jones & Passey, 2005), and chronic stress (Lessenberry & Rehfeldt, 2004).

2. BACKGROUND

Studies have found higher stress levels among mothers of children with special needs than among mothers of normally-developing children (Dervishaliaj, 2013; Jeans, Santos, Laxman, McBride, & Dyer, 2013; Lopez, Clifford, Minnes, & Ouellette-Kuntz, 2008;

Al-Yagon, 2007). The stress levels experienced by parents of special needs children is affected by the family's resources, skills, knowledge, social and familial support, and type and level of the child's disability (Singer, 2006; Dervishaliaj, 2013; Jones & Passey, 2005). Causes of stress in parents of normally-developing children may include moving from stage to stage in the educational system, providing partial information to parents by the school regarding their child's problems, or the need to fight in order to become part of the decision-making process regarding their child (Summers, Hoffman, Marquis, Turnbull, & Poston, 2005). These parents fear their child's low academic achievements, and may feel pressure due to their personal difficulties in dealing with their child's academic tasks (Webster-Stratton, 1990). Unlike them, parents of special needs children live with chronic stress (Dervishaliaj, 2013).

Despite the direction of change expressed in the growing numbers of fathers involved in raising and educating their children, mothers are still more active in caring for their children, and bear most of the burden of raising them (McBride et al., 2005). Mothers in particular express higher stress levels, and are forced to give up their careers and social activities (Rentinck, Ketelaar, Jongmans, & Gorter, 2006). Research shows that mothers of ASD (Autism Spectrum Disorder) teenagers devote more time to caring for the child and to housework, and less to leisure activities, in comparison with mothers of non-ASD children. In addition, mothers are interrupted during their work day, causing additional stress (Smith et al., 2010). Regarding the effect of the severity of the disability on stress, it was found that mothers of ASD children report higher levels of stress and lower parental skills than mothers of children with serious mental disabilities (Huang, Rubin, & Zhang, 1998). It was further found that mothers of children with behavioral difficulties report higher stress levels caused by the children's symptoms (Bristol, Gallagher, & Schopler, 1998).

Hypothesis No. 1: Mothers of children with special needs will exhibit higher levels of stress than mothers of normally-developing children.

Parents differ in the manners in which they perceive stressful situations, such as a child's illness or disability, and in the manner in which they cope with and adapt to these situations (Tak & McCubbin, 2002). A link was found between the mother's coping and the child's coping and ability to adapt (Sales, Fivush, & Teague, 2007). The present study uses Folkman and Lazarus's model, according to which coping includes an individual's cognitive and behavioral effort to cope with stress, and methods of coping vary in accordance with circumstances (Folkman & Lazarus, 1985). The resources for coping are characterized by task-oriented and problem-solving coping methods, as well as by emotional coping via the moderation of feelings of distress caused by stressful situations. Individuals use these coping styles in all stressful situations (Folkman & Lazarus, 1985). In addition, two specific coping styles – task-oriented and emotion-oriented – enable evaluation and coping, with the nature of the coping determined by relativity in the use of the former or latter style (Folkman & Lazarus, 1985). Moreover, in comparison to the task-oriented coping style, the emotion-oriented coping style has been found to be more strongly linked to stress and emotional difficulties among parents (Hastings et al., 2005). In addition, research undertaken in Israel has found that mothers of sick children more often used the emotional coping style than mothers of healthy children. Furthermore, among mothers who tended to use an emotional coping style, eg. avoiding action and denial, parental roles were compromised (Folkman & Moskowitz, 2004). Along with this, other research has found that mothers of children with special needs use a task-oriented coping style, such as requesting social support and emotional expression, more than mothers of

normally-developing children (eg: Thoits, 1995). Studies have shown that mothers of children with special needs who made use of social support demonstrated better emotional states and coping abilities than mothers of normally-developing children. Social support influences adaptation to stress (Weiss, 2002; Shechtman & Gilat, 2005; Antonucci, Lansford, & Ajroch, 2007). Furthermore, mothers of children with developmental problems who reported utilizing little social support, demonstrated higher stress levels over time (Hauser, Warfield, Shonkoff, & Krauss, 2001). Social support prevents loneliness, provides hope and strengthens the self-esteem of the stressed parent (Dahlem, Zimet, & Walker, 1991).

Hypothesis No. 2: Mothers of children with special needs will make more use of emotional coping styles and social support coping styles than mothers of normally-developing children.

Raising a child with special needs affects parental involvement in the child's education. The topic of parental cooperation with and involvement in school has lately been at the center of social discourse in Israel and elsewhere. Recognition of the parents' right to do so is essential, and could to lead to more effective outcomes for the child as well as improving the entire family's and the school staff's quality of life (Dunst, & Trivette, 2009; Fox, Dunlap, & Cushing, 2002). Studies have emphasized the need for cooperation between schools and parents of special needs children integrated in regular education.

The relationships between parents and schools can be described in a variety of ways, with different models to evaluate parental involvement (Fisher, 2009). The model used in this study, Friedman and Fisher (2003), describes the factors encouraging parents to want to be involved in their children's education. This model presents two components for parental involvement: first, the parents' identification with the educational objectives and their awareness of what occurs at school, and second, the triggering of willingness for involvement, or actual involvement, in the attaining of these objectives (Fisher, 2009). The relationships between parents and the special education staff may be ambivalent, mainly due to inefficient cooperation among professionals and parents of special needs children (Hardman, Drew, & Egan, 2002). Often, difficulties may arise at a personal level, expressed in a judgmental attitude towards the families and disregarding their needs.

However, when the dialogue between the therapeutic-educational staff and the parents is based on mutual trust and shared decisions, the bond can be very efficient (Morrow, & Malin, 2004). In research undertaken in Israel, it was found that parents of special needs children maintain contact with a variety of professionals treating their child, and therefore their involvement is frequent and includes meetings with therapeutic-educational teams (Schreiber-Divon, 2011). These meetings serve several purposes: a partnership in preparing an IEP (Individual Education Plan); evaluation and follow-up regarding different aspects of the child's progress, and participation in a Special Education Placement Committee (Reiter, 1989).

Hypothesis No. 3: The level of involvement of Mothers of children with special needs will be higher than for mothers of normally-developing children.

3. METHOD

3.1. Sample

Mothers of children with special needs (n=72) and mothers of normally-developing children (n=75) volunteered to participate in the study. Mothers' age range was 27-67 (M=39.94, SD=6.15). All mothers were married. All of the children attended regular state-run elementary schools (grades 1-6) in the Jewish sector in northern Israel. There was no significant difference between groups regarding mothers' age ($t_{(145)}$=1.02, p=0.31), number of rooms in the house ($t_{(145)}$=1.61, p=0.11), and child's gender (χ^2= 0.17, p=0.68).

Children with special needs included children that had the following disabilities (Table 1): learning disabilities and ADHD (n=28), autism (n=14), rare diseases and physical disabilities (n=7), intellectual disabilities (n=11), sensory disabilities (n=8), conduct disorder (n=4). Normally-developing children were children at the same age as the children with special needs, and the same parental socio-economic status.

Table 1.
Description of special needs categories (n=72).

Disability			Boys		Girls			
	n	percent	n	percent	n	percent	Mean	SD
1. Learning Disabilities and ADHD	28	39%	16	47%	12	32%	9.98	1.77
2. Autism	14	19%	9	26%	5	13%	9.04	2.07
3. Rare Diseases and Physical Disabilities	7	10%	2	6%	5	13%	8.79	1.82
4. Intellectual Disabilities	11	15%	3	9%	8	21%	10.23	1.60
5. Sensory Disabilities	8	11%	3	9%	5	13%	9.13	2.29
6. Conduct Disorder	4	6%	1	3%	3	8%	10.38	1.89

3.2. Procedure and tools

Class teachers were provided with letters of invitation for the mothers of the children in their classes regarding participation in the study. Mothers who agreed to participate signed the invitation letter and were then forwarded four questionnaires. The completed questionnaires were returned to the teachers by the children within approximately two weeks. Four mothers requested that the questionnaires be returned directly to the researcher.

Parental Involvement was measured using the Friedman-Fisher scale (2003) for parental involvement. The questionnaire's objective is to evaluate the parents' involvement at school. The parental involvement scale includes five sub-scales that measure the following: level of parental awareness of the school as an organization and of school pedagogy and interpersonal relationships at school (α=0.89); level of parental identification with school as a general or abstract concept and with the specific school their child attends (α=0.89); the level of school trust of the parent and child (α = 0.86); and the level of passive parental involvement (α=0.87) and active involvement (α=0.90). The level of parental identification with educational objectives and with the school, and the measure of their awareness of what goes on there, will determine parental involvement in school. Participants are asked to rank their answers on a 5 point Likert Scale from 1 (never) to 5 (always). The parental involvement questionnaire comprised 50 questions, and internal consistency was high (α=0.94).

Parenting Stress Index was measured via a questionnaire evaluating the level of parental stress [Parenting Stress Index Form/Short (Abidin, 1983) (PSI-SF)]. The objective of the questionnaire was to evaluate parental stress in parent-child interactions. The questionnaire identifies parental characteristics for mothers expressing parental stress. It includes details related to parental stress and lack of satisfaction regarding parental roles. Responses are ranked on a 1-5 scale, from "Agree" to "Does not agree". The questionnaire comprised three components: parental distress (α=0.80); difficult child (α=0.78); dysfunctional parent-child interaction (α= 0.72). Total score is composed of the sum of the item scores. The stress questionnaire comprised 44 questions, and internal consistency was good (α=0.85).

Coping styles questionnaire (Folkman & Lazarus, 1985) includes details describing various strategies people use to cope with stressful events. Participants are asked to state how much they tend to use each of the strategies when faced with a stressful event (42 items total). Answers range from 1-never to 4-often. Questionnaire items are categorized into three coping styles: task-oriented (α=0.68); emotional-oriented (including denial) (α=0.74); and social support (α=0.80).

4. RESULTS

The level of parental involvement is moderate (M=3.59, SD=0.53), the level of parenting stress is low (M=2.28, SD=0.50), the level of task-oriented coping style (M=3.35, SD=0.52), and social support coping style (M=3.30, SD=0.69) are moderate, and the level of emotional coping style is low (M=2.18, SD=0.58) (Table 2).

The correlation matrix summarizing the research variables for mothers' sample indicates that parental involvement has a significant positive correlation with task-oriented coping style (r_p=0.318, p=0.000), with emotional coping style (r_p=0.200, p=0.015), and with social support coping style (r_p=0.281, p<0.001). In addition, parenting stress has a significant positive correlation with task-oriented coping style (r_p=0.190, p=0.021), and with emotional coping style (r_p=0.492, p=0.000). Similar trends were found within each group of mothers, with no significant correlation differences among them.

Table 2.
Means, standard deviations and correlations between the study variables.

Variable	Mean	SD	1	2	3	4
Total sample						
1. Parental Involvement	3.59	0.53				
2. Parenting Stress	2.28	0.50	0.119			
3. Task-oriented Coping style	3.35	0.52	0.318***	0.190*		
4. Emotional Coping style	2.18	0.58	0.200*	0.492***	0.374***	
5. Social support Coping style	3.30	0.69	0.281**	0.147	0.653***	0.189*
Mothers of children with special needs (n = 72)						
1. Parental Involvement	3.61	0.56				
2. Parenting Stress	2.39	0.54	0.153			
3. Task-oriented Coping style	3.37	0.51	0.209	0.190		
4. Emotional Coping style	2.24	0.65	0.286*	0.490***	0.377**	
5. Social support Coping style	3.43	0.60	0.254**	0.137	0.754***	0.248*
Mothers of normally developing children (n = 75)						
1. Parental Involvement	3.57	0.51				
2. Parenting Stress	2.18	0.45	0.064			
3. Task-oriented Coping style	3.33	0.54	0.427***	0.186		
4. Emotional Coping style	2.14	0.50	0.079	0.480***	0.377**	
5. Social support Coping style	3.18	0.75	0.307**	0.098	0.589***	0.115

*p<0.05, **p<0.01, ***p<0.001

In order to investigate the differences between mothers of children with special needs (n=72) and mothers of normally-developing children (n=75) regarding stress, coping styles (social support, task-oriented and emotion-oriented styles), and educational involvement, a multivariate analysis of variance (MANOVA) was undertaken. The model suggests significant differences between the two groups of mothers (Table 3) ($F_{(5,141)}$=2.51, p<0.05, η^2=0.08). This model revealed a significant difference in the sense of stress ($F_{(1,145)}$=6.66, p<0.01, η^2=0.04), such that the sense of stress among mothers of children with special needs (M=2.39, SD=0.54) was found to be higher than the sense of stress among mothers of normally-developing children (M=2.18, SD=0.45). Another significant effect was detected in the social support coping style ($F_{(1,145)}$ =4.69, p<0.05, η^2=0.04), such that mothers of children with special needs utilize the social support coping style (M=3.42, SD=0.60) more than mothers with normally-developing children (M=3.18, SD=0.75). ´

Table 3.
Multivariate analysis of variance (MANOVA) for the difference between mothers of normally-developing children and mothers of children with special needs.

		Mean	SD	F	df	η^2
Parenting Stress	normally-developing	2.18	0.45	6.65**	1,145	0.04
	special needs	2.39	0.54			
Social support Coping style	normally-developing	3.18	0.75	4.69*	1,145	0.04
	special needs	3.42	0.60			

Note: *p<0.05, **p<0.01, ***p<0.001

In order to investigate the differences between mothers of children with special needs (n=72) and mothers of normally-developing children (n=75) regarding the three components of stress, an independent sample T test was undertaken. Mothers of children with special needs (M=2.26, SD=0.61) appear to suffer from more child-related stress than mothers of normally-developing children (M=2.01, SD=0.51) at a significant level ($t_{(145)}$=2.66, p=0.006). In addition, mothers of children with special needs (M=2.62, SD=0.55) demonstrate more dysfunctional parent-child interaction than mothers of normally-developing children (M=2.32, SD=0.49) at a significant level ($t_{(145)}$ =3.46, p=0.008). No significant difference was found between mothers of children with special needs (M=2.20, SD=0.68) and mothers of normally-developing children (M=2.15, SD=0.51) regarding parental distress ($t_{(145)}$ =0.48, p=0.22).

In order to investigate stress and the three coping styles (social support, task-oriented and emotion-oriented) as predictors of mothers' educational involvement, a step-wise regression analysis was conducted for each of the groups of mothers. With both models, the predictors of educational involvement entered were a sense of stress and each of the three coping styles mentioned above. Among mothers of children with special needs, the model explains 8% of the variance in the variable of educational involvement ($F_{(1,70)}$=6.22, p<0.05), all of which can be attributed to an emotion-oriented coping style (B = 0.24, SE = 0.01 , β = 0.29 , t=4.04, p<0.001). In addition, regarding mothers of normally-developing children, the model explains 18% of the variance in educational involvement ($F_{(1,73)}$=16.25 , p<0.001), all of which can be attributed to task-oriented coping style (B = 0.40 , SE =0.10 , β = 0.43, t=4.03, p=0.000).

5. FUTURE RESEARCH DIRECTIONS

In light of the change presented in the literature regarding the new perception of paternal roles (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004), fathers' attitudes should have been examined as well. From a methodological aspect, instead of measuring the mothers' educational involvement in self report questionnaires, empirical measurement should be undertaken (eg: coming to school, participating in meetings, etc).

6. DISCUSSION

The present study examined the effect of stress and coping styles on the level of educational involvement of mothers of normally-developing children and mothers of children with special needs who are integrated in regular elementary schools. Similar to previous studies (Singer et al., 2007), we found that mothers of children with special needs experience more stress than mothers of normally-developing children. Moreover, the findings confirm the hypothesis that mothers of children with special needs utilize a social support coping style more than mothers of normally-developing children. Task-oriented coping style was found to be a predictor of educational involvement only among mothers of normally-developing children. No differences were detected in the mothers' level of educational involvement.

Regarding coping styles, previous studies have demonstrated that social support coping style is popular in situations of stress among parents (Folkman & Moskowitz, 2004). Consequently, one can expect this style to be more popular among mothers of children with special needs than among mothers of normally-developing children, as the former experience more isolation and stress than the latter (Glidden, Billings, & Jobe, 2006). Moreover, we did not find any difference between the two groups of mothers in emotion-oriented coping style, although mothers of children with special needs experience higher levels of stress and tend to utilize an emotion-oriented coping style due to conflicts with school staff (Folkman & Lazarus, 1985). Yet, in the prediction examination, the emotion-oriented coping style was found to be a predictor of educational involvement among mothers of children with special needs, while among mothers of normally-developing children a task-oriented coping style was found to be a predictor. These findings can be explained via studies according to which families of special needs children tend to use emotional coping alongside a variety of coping styles (eg: Nixon & Cummings, 1999).

In consistency with studies that did not detect a difference in the level of educational involvement at school between the two groups of mothers (McKinney & Hocutt, 1982), we did not find any differences in educational involvement between mothers of children with special needs and mothers of normally-developing children. Indeed, research has found a low level of educational involvement among parents of special needs children (McKinney & Hocutt, 1982; Reiter, 1989), demonstrating that these parents do not always seek a full partnership with the school (Sandow & Safford, 1986). In addition, it should be pointed out that educational involvement comprises a number of components, such as vigilance, identification and display of trust in the school (Friedman & Fisher, 2003). Hence, there is a need to examine the differences between the two groups of mothers regarding each of these components separately.

In conclusion, the present study focuses on the variables predicting educational involvement of mothers of children with special needs. Emotion-oriented coping style has been found to increase these mothers' educational involvement. In addition, it appears that

these mothers tend to utilize a coping style that seeks social support. From a practical viewpoint and in light of the growing trend to integrate special needs children into regular schools, these research findings should contribute to the development of involvement programs for the raising and encouragement of educational involvement among parents of special needs children integrated into the regular educational framework.

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Chapter #6

FLIPPED CLASSROOMS, FLIPPED HOMES? TENDING TO STUDENTS' PERSONAL COMPETENCIES

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ABSTRACT
Sharply increased workforce demands for computer skills are due to the significant effects that technology and media use have had on several aspects of daily life. 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 is indispensable to enhance the individualization and differentiation of learning, and serves as the pillar of competency-based education. The swift pace of change, however, has raised concerns and reluctance from practitioners and other stakeholders. As with any and every innovation, its use is as good as its users. Educators who are utilizing technology and media advances in a targeted and purposeful way can 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. The flipped classroom framework is discussed as a context in which media integration can foster competence-based, personalized education.

Keywords: student competencies, flipped classrooms, technology integration, parent involvement, home-school interactions.

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 (Perrin & Duggan, 2015) reports that in the U.S. 97% of teenagers ages 12-17 and 96% of 18-29 year olds have internet access. OECD (2015) 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. 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 TECHNOLOGY USE AND STUDENTS' PERSONAL COMPETENCIES

Called this generation's "Sputnik moment," access to technology and the internet are deemed essential for 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.

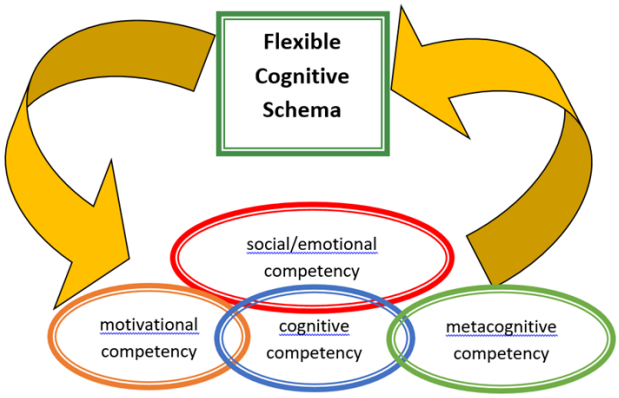
Competence-based education extends beyond knowledge-transfer, and requires the learner to demonstrate targeted content and skills. This approach culminates into a higher order of learning that is assessed by a comprehensive student evaluation. Such an evaluation is embedded throughout the educational 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 novel skills.

A way to foster a cognitive flexible schema is by placing an emphasis on personal competencies as a framework to build the students' capacity to learn. In proposing such a framework, Redding (2014) makes the important distinction between "competence" and "competency". The former reflecting a certain degree of knowledge required to be functional in any given area, whereas the latter term denoting not a set capability, but a conglomerate of factors facilitating life-long learning. An essential part of the personal competency framework is 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-regulation (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 (see Figure 1 for a pictorial depiction of competency and flexible cognitive schema inter-relationship).

Figure 1.
Flexible cognitive schema and personal competencies.



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 adopt 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 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 is 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?

There is no single definition for flipped classrooms. What lies in the core of this approach is assigning student instructional content prior to coming to class, so that in-class time can be spent working on applications instead of lecturing (DeLozier & Rhodes, 2017). The term "flipped learning' is also used to describe a broader pedagogical approach along the same lines. Both terms point to a student-centered approach with a dynamic interaction between the instructor and the learner, where student needs are tended to in a more targeted and personalized way.

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. Therefore, aspects of the flipped classroom are not novel. Other parts may seem a departure of the traditional classroom approach, such as spending

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. Benefits of this approach include, more personalized learning as students move at their own pace; more efficient use of classroom time; better insight of learning styles and issues through monitoring in-class student work; and, higher levels of student engagement with the content (Fulton, 2012a)

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, but rather a student-centered approach. The misperception may be stemming from the fact that teachers in a flipped classroom often need to create short instructional videos that students can watch at home in addition to any assigned readings. This prospect of media development and integration can make teachers wary of yet more requirements to which they would have to tend. However, as Bergmann and Sams (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 the 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. Aspects of flipped classrooms and personal competencies

A starting point for educators is to examine which courses are best suited for the flipped classroom model or a technology-enriched classroom – not all are equally well suited for 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, whereas students who may need to view material multiple times, could do so as well (Goodwin & Miller, 2013). In addition, within the flipped classroom mode of instruction, students can more effectively monitor their personal learning process, reflect on, and evaluate it leading to increased self-regulation (Lai & Hwang, 2016), an essential part of the metacognitive competency.

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). Providing real-time feedback is crucial to correcting student misperceptions as soon as possible, and, therefore, improve learning (Goodwin & Miller, 2013). 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. Consequently, teachers can demonstrate the benefits and support the development of a flexible cognitive schema that is essential to keeping up not only with curricular demands, but also with the fast pace of an ever-evolving tech-based world.

Evaluation also assumes a different role as students are assessed along the way, ensuring that students master curricular components 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. For example, it is easier to assist students in identifying areas of strengths, as well as growth, and guide them to improve on weak areas during class time that would have otherwise been spent on lecturing or knowledge transmission. Through basic activities of drawing concept maps, but also higher-order activities of applying concepts and problem solving, either in groups or individually, teachers can obtain a good idea of student learning and progress, and intervene early as needed. 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) 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.

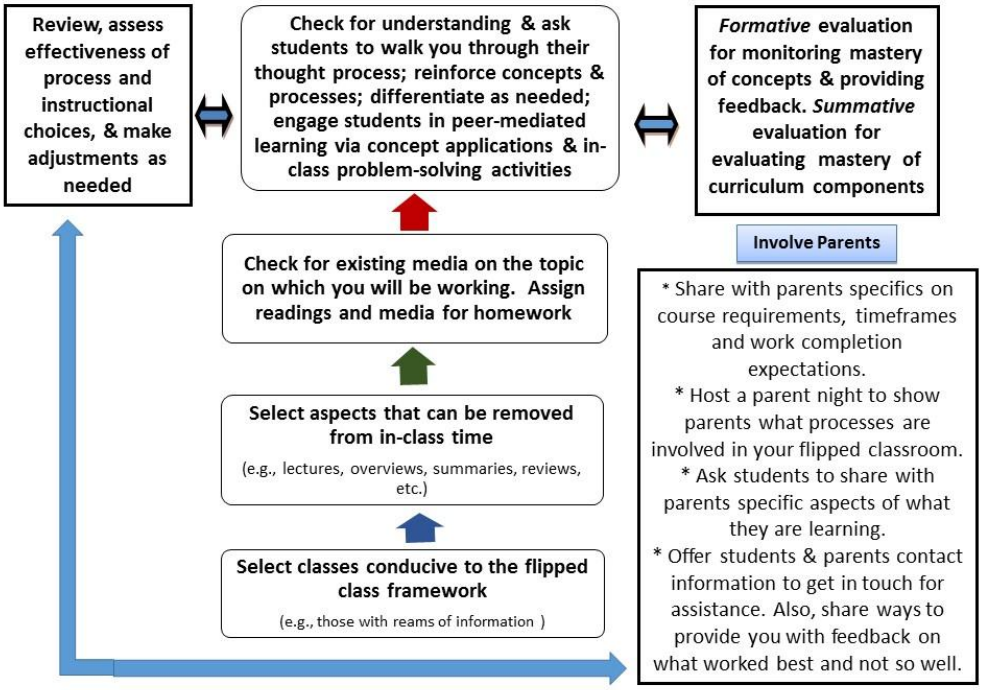
Summative evaluations can also be individualized, therefore closely addressing students' personal competencies and better assessing mastery levels. As Bergmann and Sams (2013) suggest, setting clear, discrete learning objectives, and creating a test bank with several items for each learning objective 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 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, which 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 (Hall & Stegila, 2003; Bell & Carter, 2013). In addition, through these activities, social/emotional competencies can be practiced and monitored by teachers who can mentor students to successfully navigate teamwork by setting clear roles, responsibilities and expectations, as well as modeling, and re-directing. 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 development of intrapersonal and interpersonal skills (Weissberg & Cascarino, 2013).

By and large, the flipped classroom model requires a shift from traditional, teacher-centered instruction to student-centered instruction. Such a framework requires re-examining and changing the role of educators, and calls for a significant shift of pedagogical paradigms. This shift does not diminish the role of educators; on the contrary, it provides teachers with the power to really exercise pedagogy (παιδαγωγία) in its inquiry-based, Socratic approach to learning, paradoxically returning to the root of Ancient Greek *paideia* via the use of technology. After using lecturing for years as the main means of instruction, Eric Mazur, a physics professor at Harvard, realized that his students could not engage in problem-solving that he thought would have been easy for them (Mazur, 2009). He realized that "the traditional approach to teaching reduces education to a transfer of information" (p. 50). Moore et al. (2014), who applied the flipped classroom model on math classes, remark that getting to know their students' thought process through richer in-class interactions over problem-solving tasks, "strengthened our practice as teachers and made us feel that our investment in setting up the flipped classroom was worthwhile" (p. 424). Within a global context and the technological advances that have provided us with immediate access to knowledge, such a shift seems inevitable, self-evident, and fitting our rapidly changing world (see the Figure 2 for the inter-relationships of processes in technology-enriched and flipped classrooms, and parent involvement).

Figure 2.
Technology-Enriched and flipped classrooms: 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, but most others needing teacher assistance the following day. The nature of homework requirements within the flipped classroom changes as concept applications are completed in class, while informational aspects are 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. A tenth grader notes, "I liked that we watched the concept at home, but then mastered the concept in class" (Fulton, 2012b; p. 14). A high school senior adds, "I liked how I could rewind and pause lectures in case I didn't understand something" (Fulton, 2012b; p. 14).

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.

An additional benefit of flipping the work directly related to family life, is that it alleviates the heavy burden that homework often places on families. Since applications, which would have otherwise been assigned as homework under the traditional approach, are primarily completed in class, students can ask questions and seek out help from their teacher, instead of struggling to tackle the work at home with parents in the striking majority of cases unable to help. Fulton (2012b) reports that 84% of parents whose children were exposed to the flipped classroom model reported that this was their preferred instructional delivery mode for their children. One parent put it succinctly, "That [flipped classroom] approach is much more helpful to students. Less frustration for all of us!" (Fulton, 2012b, p. 23).

Extended technology use by schools, not only within a technology-enhanced classroom framework, but, also, 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 allowing for both asynchronous and synchronous modes of communication[11] 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 the educational process, not only home-school communication can be enhanced, but also parent involvement 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 alienate and isolate themselves.

[1] *Asynchronous* communication refers to communication not occurring at the same time, such as sending an email or a text; *synchronous* communication refers to communication occurring at the same time with all participants being logged on simultaneously, such as a webchat, FaceTime, etc.

5. CONCLUDING

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. The basic principles that lie in the heart of responsive, caring education have not changed. What has changed is modes of communication and instruction-delivery options, due to rapid technological developments, workforce demands, and the competitive nature of globalization. As with any and every innovation, its use is as good as its users. Technological enrichment cannot only enhance classwork and homework, but it can significantly strengthen home-school relationships to further support student success in school and beyond.

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Short biographical sketch: Dr. Eva Patrikakou is a professor at DePaul University's Department of Counseling and Special Education, and the Director of the Special Education for Teachers – Learning and Behavior Specialist program. Dr. Patrikakou has done extensive research on parent involvement, for children with and without disabilities, and its effects on students' academic, social, and emotional development. She has also conducted research in the area of Response to Intervention (RTI). Dr. Patrikakou has authored numerous articles and chapters, as well as has presented her work on parent involvement, school-family partnerships, and RTI at national and international conferences. She has also directed the development of school-family programming to enhance home-school relations and student success. Dr. Patrikakou has been systematically working to better inform practitioners, facilitate their outreach efforts, and bridge the research-practice gap on issues around collaboration, comprehensive services, and school-family partnerships.

Chapter #7

ENTRY INTO GREATER DIVERSITY – INTERDISCIPLINARY SCIENTIFIC-TECHNICALLY PROJECT LABORATORIES

New Learning Settings in a Globalized World

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ABSTRACT
Since 2013 HTW Berlin has been working with a special form of interdisciplinary project laboratories. This kind of learning process is characterized by very active participation of the students and it creates open spaces and opportunities for international cooperation. Students exert their influence on the contents of the projects and lectures during the course. The teaching process based consequently on partnership of the students and the teaching staff. The courses consist of students from different departments of the HTW Berlin. Participants are supervised by scientific-technically oriented interdisciplinary professional staff. Thereby the learning setting intends to motivate Bachelor (BA) and Master (MA) students to conduct independent development and research, to apply new form of presentation skill and to engage on an international level scientific discussion. Interdisciplinary project laboratories courses are particularly suitable for new methods of transcultural learning. The methods and goals of the courses are designed to be carried out on the basis and demands of a world with grown mobility and immigration.

Keywords: interdisciplinary project laboratory, culture-sensitive strategy, transcultural learning, soft skill exercising, digital storytelling, international cooperation.

1. INTRODUCTION

For the last several decades, increasing globalization and higher mobility have facilitated the transnational cooperation between universities and research institutes. As the knowledge transfer and communication grew larger, global topics have become relevant factors in learning settings, optimizing an international access to new forms of teaching and learning and including topics like how to address sustainable development, energy and water for all, climate change and poverty eradication using innovative technologies and green ideas (Farach et al., 2015).

The German Hochschule für Technik und Wirtschaft Berlin (HTW Berlin) pursues a globalization approach (HORIZON), creating opportunities to gather experience abroad and maintaining international cooperation in the teaching and research (HORIZON, 2016). At the same time HORIZON stands for expanding the own horizon, changing perspectives and personal development. The practical goal of this strategy is to foster internationalization at HTW Berlin, developing possibilities and opportunities for the students to gain intercultural skills and international experiences, by stimulating the contact and interaction among students of different nations and cultures at HTW Berlin (HTW-INTEGRA, 2017).

Within the HORIZON, opportunities are provided for HTW members and students to collaborate with an international partner institution at different levels. According to a main research/project theme proposed by the group of 2 to 6 students jointly develop and pursue research projects over a period of one or two semesters. In doing so, the participating students collaborate both in small teams at their individual discipline or across the disciplines. In order to enhance this exchange of ideas, questions, and knowledge over the span of time and geographical borders, two ways of communication are combined: the 'classic' methods of onsite face-to-face group work and new digital forms of communicating and e-learning (moodle work space).

2. BACKGROUND / CONCEPTUAL FRAMENWORK

In order to create innovative forms for teaching Department I of HTW Berlin has launched the interdisciplinary project laboratories. The first one is called Project Laboratory (ProLab) course, the second one is called Research and Development Laboratory (R&DLab) course [reference]. Participants will be addressing their own questions, challenging identified matters of fact, finding their own solutions and thereby acquiring knowledge. From the didactic point of view, these HTW Labs are less teaching special knowledge in the classical sense of instruction, but rather give an opportunity for students to participate actively in innovative research trends and to actively acquire, try out and develop new methodological and subject-based knowledge and skills (Følstad, 2008). The academic staff involved in these projects therefore act as mentors, coaches, and facilitators rather than instructors and teachers. From the interdisciplinary point of view, the educational objectives for the participating BA and MA students are: research experience, disciplinary reflexion on co-design (insights into different research-cultures, like African digital storytelling) and theoretical approaches/new methods (design thinking), language competence (team-teaching), and intercultural competence (Fog, 2010).

2.1. Broad access to interdisciplinarity

At the HTW, Berlin, we offer students new forms of elective courses. Both courses arose within the context of natural science and technology disciplines. The subject matter of these courses isn't the knowledge transfer of a special scientific discipline rather, course participants should practice important soft skills (see figure 1). They get a methodological background and learn general fundamental methods to solve different kind of complex problems and challenges. Interdisciplinary team work and cross-cultural competences are defined targets. The participants favour a pragmatic approach in order to identify the need for truly useful settings and new technologies (Stauffacher, Walter, Lang, Wiek, & Scholz, 2006).

That's why these courses are open to all students (all terms and BA and MA degree programs). That means students with different specialities (Engineering, Information Technology, Economics, Life Sciences, Culture & Design) come to work and learn together in interdisciplinary and term-overlapping structures.

Figure 1.
Scientific-technically project laboratories - Design Science Approach.

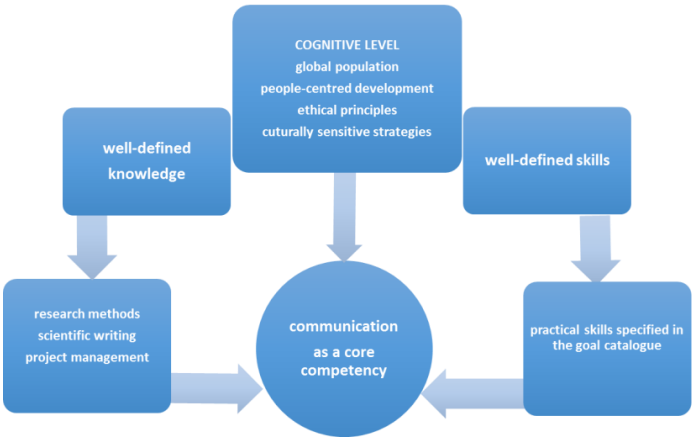
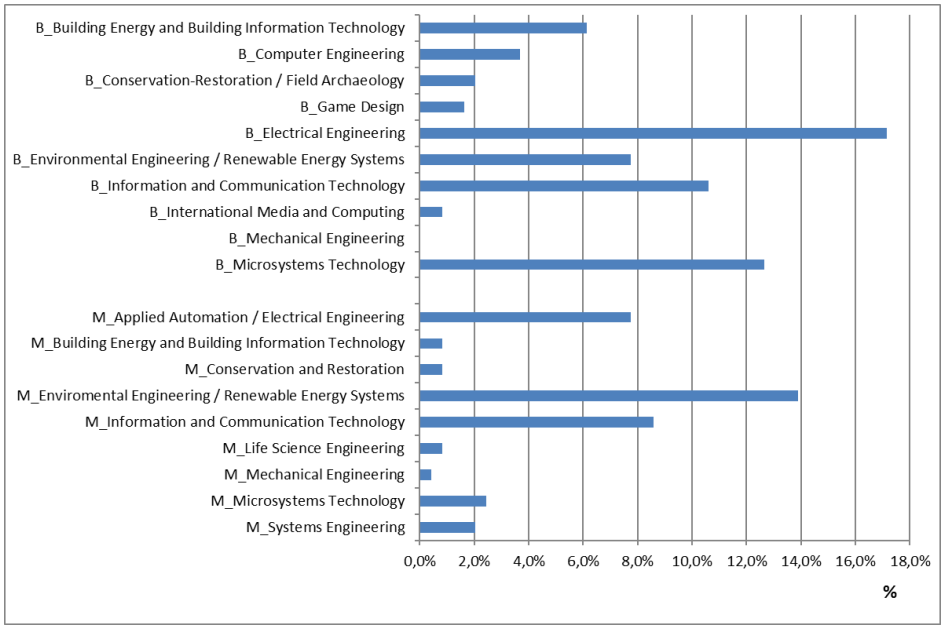


Figure 2 illustrates the composition of the programs involved in the courses. Over hundred participants took place on these elective courses during the last eight semesters. They came from different programs. The majority of the participants are enrolled in a BA program which accounts 56 %, and the remaining 44% participants are MA students. The number of participants of these elective courses showed a high rate of increase with only about 5 % dropout rate, which the lowest as compared to other courses with 15 to 20 % dropout rate (Bailleu, Kröger, Menge, & Münchow-Carus, 2015).

Figure 2.
HTW Berlin programs where the participants came from.



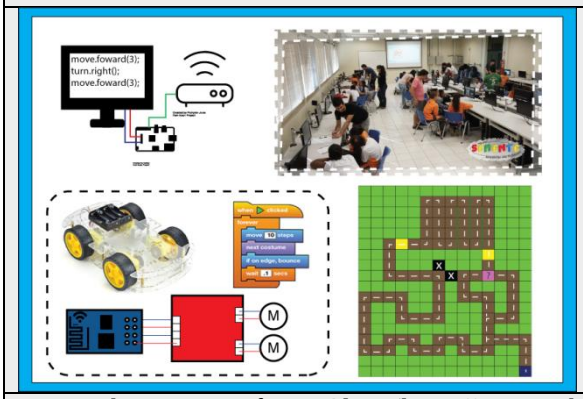
2.2. Structure and workflow

At the beginning of HTW ProLab and R&DLab students introduce themselves and present their first project ideas (Bailleu et al., 2015). The mentioned internationalization strategy requires close cross-border coordination and adapted learning settings [reference]. The courses are running in German, English or bilingual with the help of native speakers as team teachers. However, when working with different topics and international levels, the teaching staff needs to be on one hand observant as regards the information collection and bibliography research, development of solutions, presentation and dissemination of the projects and on the other hand direct mentor for different groups and individuals.

The realization effort of the ideas is discussed between course participants and the teaching team (Marr, 2010). Ideas concerning the implementation time, budget and scientific contents requirements of the course have got accepted. Figure 3 shows an example of an integral part of the course: the budget planning process.

Figure 3.
Example of student´s budget planning.

EDUCATIONAL ROBOTS - SOLUTION FOR A BETTER WORLD



Materials procurement process: "At first we are aiming for a very simple robot, making it cheap for easy testing and implementation" (Luiz Alves)

1. ESP 8622

(WIFI module)

2. H-Bridge

3. Distance Sensor

4. Motors and Wheels

Pictures by courtesy of Luiz Alves (https://www.techenergy-for-africa.de/intiative-nachhaltigkeit/technik-für-den-menschen/ (accessed 2017 August 17)

3. TEACHING METHODS AND EVALUATION

Worldwide learning settings still are often characterized by traditional learning methods, which rely largely on the memorization of information. In these setting creativity is often discouraged rather than encouraged (Florida, 2002). The teaching method of the courses ProLab and R&DLab, as already described before (Kröger, Bailleu, & Münchow, 2016, Bailleu et al., 2015). It seems that the practice-orientated work is more powerful than traditional forms of teaching as it allows international students to be presented in new ways where visuals and interactivity can add to and enhance the learning experience (Følstad, 2008). To evaluate the transferability of student's work in different international settings, we use the CATI model to analyse the design and the functionality from different perspectives (Vesisenaho, 2007). Figure 4 shows the CATI model (model for technology transfer: contextualize, apply, transfer, import) as the underlying concept.

Figure 4.
CATI as underlying culturally sensitive concept.

The teaching method is practice-orientated project work instead of the usual lectures or classical tutorials. Classical lectures and tutorials are offered on demand in the courses only as an additional support. The participants are supported by several laboratory engineers and other staff members, whenever relevant expertise and instruction are needed. The key experience was that in international groups the participatory design process is more important than the production itself (Hecht, & Maas, 2008).

4. REALISATION AND RESULTS

When designing learning environments for the next generation students with an international context, what are the advantages of the interdisciplinary project laboratories? This chapter presents our main results and experiences.

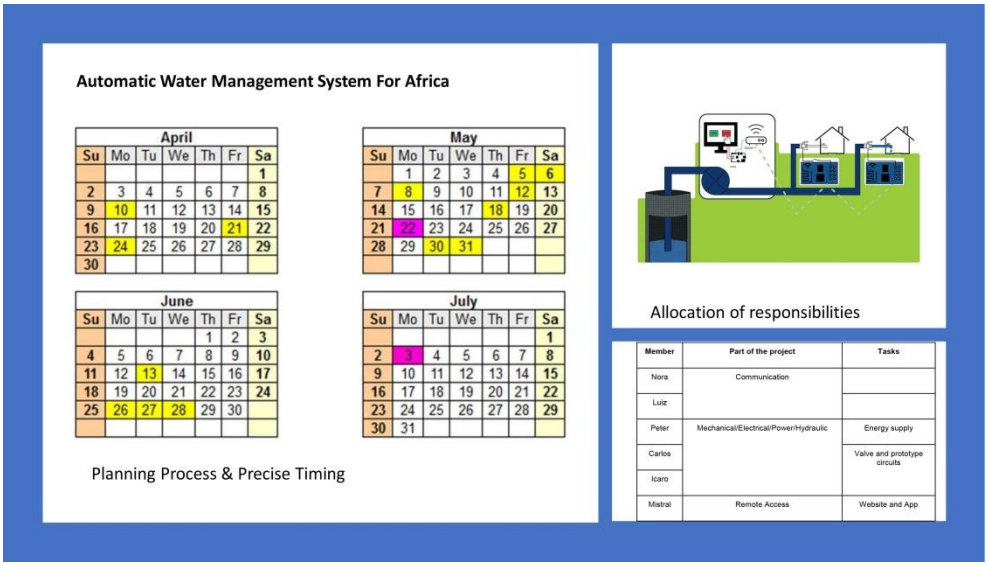
Normally, an individual introduction for every participant and project proposals are submitted by the students and by the teachers during the first unit. This unit is the only one with compulsory attendance for all participants of the courses. The very exceptional and interesting ideas to be realized in promising projects are listed at the beginning of a course.

4.1. Team building, support and project management

During the first unit students get short lectures in project management, team building, design thinking, efficient communication structures, and presentation skills. The realization effort of the ideas is discussed with all the course members and the teaching team. Ideas meeting the timeline, budget and scientific contents requirements of the course get accepted. During the team building process the students form project groups. As an accompanying support, the teach-team offers elective units on demand, for instance: brainstorming sessions (Mind Mapping), CAD-tools and CAD-Systems (CAD computer-aided design), EDA-tools (EDA: electronic design automation), Programming (LabVIEW), Data analysis, Software for Project planning and controlling.

A specific example (figure 5) may be used to demonstrate the overall planning, the precise timing and the allocation of responsibilities to the international group of students (Brazil, Cameroun, Germany, Spain, pictures by courtesy of the whole group).

Figure 5.
Planning process and allocation of responsibilities.



4.2. Examination & performance skills

Examination of students consists of the individual oral presentation and discussions. In addition, there is a practical presentation (demonstration) of the project results by the project team. Furthermore, the project teams have to deliver a written project documentation consisting of description of the aims of the project giving details about project partners, implementation region, project term and budget and role allocation in the project. In the meantime, real interaction and cooperation with abroad students will give opportunity to the HTW Berlin students to expose their projects to other students during a short period and to get values feedback.

4.3. New role perception of the teaching staff

As the main result, it can be noted that the courses are characterized by more differentiated role perception, but also deeper intercultural understanding. In addition to the monitoring of the projects, the teaching and administration staff ensures the smooth running of the courses: room and laboratory management combined with other tasks to ensure that excellence are provided to the expected level. The professors and laboratory engineers work as senior consultants for all projects in both consecutive courses.

4.4. Spectrum of project results

The results of the projects are widely spread. An overview of projects realized within the scope of courses ProLab and R&DLab during last years are given on our website (Kröger, 2017) and selected examples are described in several conference papers (Bailleu et al., 2015, Kröger et.al., 2016 and Bailleu, Kröger, & Münchow., 2016).

Often the students focus their practical projects to their interests in energy generation. For instance, a project group inspired by existing concentrated solar power plants (CSPs) builds a working model of such a power plant. CSP version vs the realized model is shown in figure 6. A field of mirrors concentrates sunlight onto a solar power tower. The realized model produces energy to heat up water.

Figure 6.
CSP-Concentrated solar power plant.

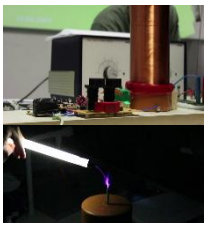
(a) Inspiration of the project idea: A concentrated solar power plant (CSP) in Nevada (USA)

(b) Model of a concentrated solar power plant (CSP)

Other practical project results in this content with high electrotechnical aspects were a self-made wind generator, a Tesla coil and an electrostatic generator based on a Kelvin water dropper (see figure 7). Such results are impressive considering to the scheduled workload for a course (100 hours) and the small budget (50 €) for a project group (Bailleu et al., 2015).

Figure 7.
Selected examples with high electro technical aspects.

(a) Self-made wind generator

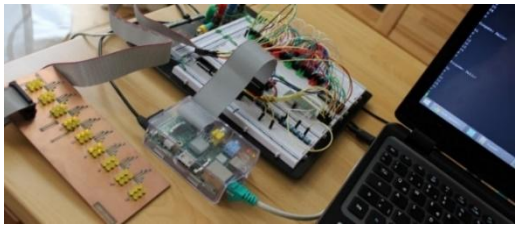


(b) Tesla coil

(c) Kelvin water dropper

Often the students look enthusiastically for solutions in context of biomedical applications during the project laboratories. An example of this is an e-book-reader with Braille lettering output (figure 8).

Figure 8.
E-book-reader with Braille lettering output.



It is possible to translate any text into Braille with the realized setup shown on the left hand side of figure 8. You can see 9 segments, written is “hallo”. The Braille display is symbolized by LED cells.

Many ideas for projects are created by the students completely unassisted. Other projects are proposed by the teaching staff or are found (mostly by the students themselves) on websites or books, as for example how to build a Stirling engine from an ordinary food can and a simply recreating wooden part (Viebach, 2010) or the idea for the project “fridge in a vessel”, which is suggested in a very nice booklet with the (translated) Name “inspirations instead of wastes” (Kuhtz, 2012) and (Mathieu, 2006-2016).

It is not possible to illustrate the complete diversity of the projects. Some of our students combine their interests for music and for modern technical opportunities during the project laboratories. Examples of such projects are a guitar amplifier (without a figure), a Theremin (figure 9) and a luminous cube realized with a micro controller to control the light phenomenon by classical music (figure10).

Figure 9.
Students playing their Theremin.

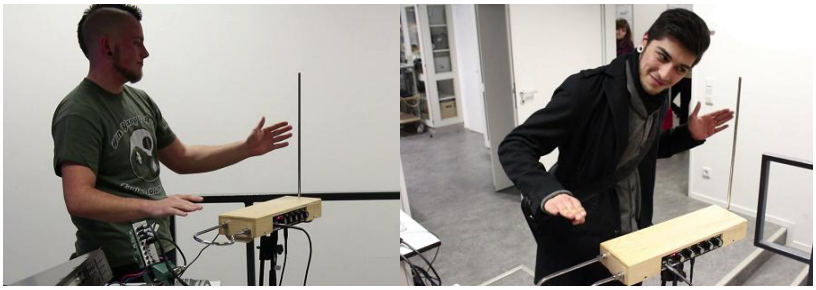
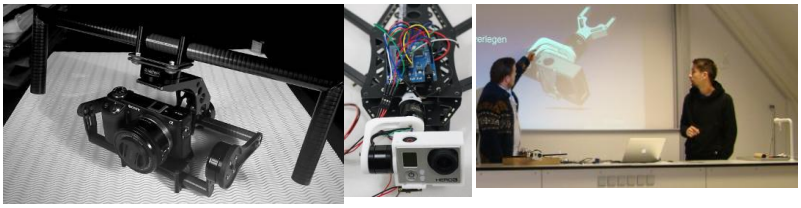


Figure 10.
Luminous cube realized with micro controller.

The presentations of instrument-based results were always very impressive and funny shows.

Even industrial products are results of the courses, for example the two camera gimbal projects (figure 11). The left one camera-gimbal was realized for manual use in helicopters. Finding an industrial partner made the development and the prototype possible. It became an industrial duplicated part by now. The other one was realized for automatic use of a GoPro-action-cam.

Figure 11.
Camera gimbals.



(a) Handheld gimbal for manual camera use in helicopters
(b) Go-pro- action-cam gimbal version for automatic camera use and
(c) Presentation of the gimbal project results

Another group developed additional bike displays during two consecutive courses. A group of only two students developed hardware for bikes and an App for Windows Mobil which provides driving information of a motorcycle (figure 12). A smart phone is used additionally to the normal bike display. The result of this project appears almost like a professional development.

Figure 12.
Driving information for bikers.

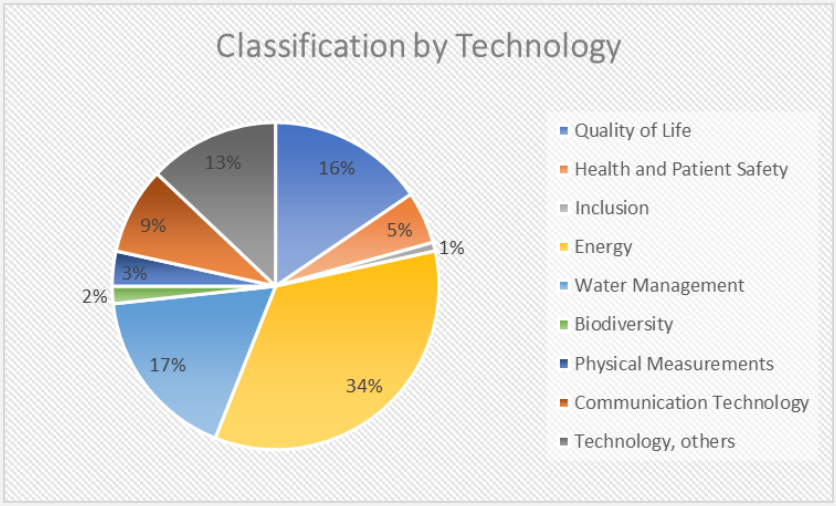
Multiple benefits derive from the presented practice orientated project work in interdisciplinary term-overlapping structures in more than one case.

Some of results are used as demonstrators in the physics lesson of several Bachelor's degree programs (e.g. figures 6-8). This means students learn by themselves and produce learning tools for other students within the same process. Other one are used to promote the technical courses at our university by funny and popular results of our students (e.g. projects like shown in figures 9, 10). Some results of this project work were used in research projects of our university of applied science (without a figure) and a few of project results become real usable products (e.g. projects shown in figures 11-13).

Figure 13.
High speed power bank for mobiles.

Often especially such students, which do not have the best success in classical courses, excel by trying to get optimal project results. They are highly motivated from the beginning to the end of the project laboratories or they become highly motivated during the courses because of the direct feedback, the practical success, the appreciation of the team and the teaching staff. Figure 14 indicates an overview of topics.

Figure 14.
Classification of topics.



Classification	**Topic Selection (small incomplete excerpt)**
Inclusion and Access	E-book-reader with Braille Letter; Educational Robots for implementation in Brazil; Make colour hearable (colour to sound transfer); Elektromyogram to control computers;
Water Management	Transboundary Water Management in Africa through the establishment of dialogue platforms; Automatic Water Management System Purification of water in crisis regions or in civil protection;
Energy	Problems of Energy Generation (CSP-Concentrated solar power plant);
Technology, others	GoPro-action-cam-gimbal project for manual use in helicopters; Additional bike displays Wind hamster: high speed power bank for mobiles
Quality of Life	App for Windows Mobile which provides driving information of a motorcycle

4.5. New forms of external presentation

Another idea of the Project Laboratory course was that the students should present their projects to the public, for example during the open day at the university or on events in schools. Besides the presentation exercises for the students, it is a good possibility and opportunity to increase attractiveness and visibility of scientific and technical studies. The solutions were presented on several occasions, like Open-Day Events, Long Night of Sciences, especially in direct dialog with citizens (Fair of Bridge-Builders at Berlin Alexanderplatz, see figure 15).

Figure 15.
The Bridge Builder.

Berlin Alexanderplatz Kenako Fair: The Bridge-Builder.
Participant of the HTW ProLab presenting his concept about vertical farming.

Project Presentation *Berlin Kenako Fair*
Pictures by courtesy of Paul Knopf

5. FUTURE RESEARCH DIRECTIONS

In the further development of the courses, the aim will be an extension and adaptation of the concept to other fields of study and research areas. Within the framework of the so called ‘digital forest’ Department I of HTW Berlin which aims to establish a continuous exchange of ideas on different topics. Other forms of knowledge transfer (Hackathon Global Health) are planned with the Universidad Politécnica de Madrid (Spain), and in the energy sciences field, there are various interests in cooperating in the field of water management (Cameroun) or also education roboter (Brazil) and diversity studies (Namibia) with different intercontinental partners. Extending the concept will – with the

accompanying research on the effect for students and teaching staff – provide answers to questions that have arisen from the first experiences (Bailleu et al., 2015).

Research-orientation in the courses ProLab and R&DLab may mean very different approaches depending on the field and discipline. This has immediate consequences for the organizers of the research process within the courses.

HTW Berlin has to react to diverse target groups within the student body, taking into account their different experiences with team working in a foreign language, working autonomously and producing results – i.e. presentations and publications, mostly investing additional time that required by their study program. Making use of electronical tools, and providing digital media for a multinational and in many senses 'blended' laboratory will be just one aspect of the further development, which can in the coming years to become one of the hallmarks of teaching.

6. CONCLUSION/DISCUSSION

The learning environment, which is designed without regarding the context of the learners does not touch the participants to any deeper level, and this curbs their ability to learn from the designed environment. In conclusion, the presented teaching method seems to have more advantages. A lot of students prefer to do some practical work during their studies. In most of the cases, they are very involved in their own projects. The learning process takes nearly by the way because it is a kind of learning by doing.

The presented new forms of learning combine research-based learning with international cooperation, and thereby they can motivate bachelor and master students to conduct research and to be engaged in academic discussion and in international frameworks. The courses increase the awareness of different research traditions and subject specialisations, and it sharpens the perception of different cultures of learning. The courses are purposefully designed around a suite to different digital communication tools, as digital storytelling. We regard this as a vital prerequisite for sustainable collaborations in the context of research-driven learning. Flexibility, openness and willingness to adopt different methods are essential in order to adjust the concept to different fields of research and teaching.

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ACKNOWLEDGEMENTS

We gratefully acknowledge the head of our university for the benevolent support.
For important contributions and ideas, we would like to thank specifically Gernot Welschhoff (HTW Councelling for international students), Prof. Dr. Pedro Fernández Carrasco (Universidad Politécnica de Madrid, Spain), Romeo Pikop Pokam & Jessica Zinn (TechEnergy for Africa e.V.).

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Chapter #8

TOWARD WIDER EXPLANATIONS OF TECHNOLOGY ADOPTION
The Case of Secondary Education Teachers in Bucharest, Romania

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ABSTRACT
The dominant theoretical model in the field of technology adoption by individuals, TAM, has come under recent criticism for having had an oversimplifying effect on research.
This paper aims to widen the universe of possible explanations of *ICT use* and *intentions* of use, by simultaneously testing for a large number of variables advanced by the main theories in the field. The study is based on a survey of 845 secondary education teachers primarily from Bucharest, Romania.
Our regression analysis (OLS) results show that: 1) a high percentage (60%) of variance is explained; 2) the results of the *use* and *intentions* models are quite different; main relevant direct explanatory variables for use express capability, opportunity and social influence: *ICT access*, *ICT skills*, and *observability*; while the main explanatory variables for intentions are *computer enjoyment*, *compatibility*, *perceived usefulness*, *image* and *self-efficacy* denoting psychological motivations; 3) TAM variables, *perceived usefulness* and *perceived ease of use*, don't play a very important role (the former is significant in the model of intentions only, and the later not at all), suggesting that broader models of direct determinants of technology adoption need to be constructed.

Keywords: technology adoption, information and communications technology, secondary education, teachers, Romania.

1. INTRODUCTION

There are several theories which can be considered the main or most influential in the study of information technology adoption by individuals, whether in the area of education or others: Innovation Diffusion Theory (IDT), Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), and Theory of Planned Behavior (TPB). Most research studies in the past 30 years have usually investigated models suggested by one of these theories, plus a few variables suggested by others. There have been very few studies that have developed comprehensive models positing most variables of the most important theories against one another in a unitary model. The field has come under criticism – primarily directed at TAM – for proposing rather limited and simplistic models (Benbasat, & Barki 2007; Bagozzi 2007). In particular, in the context of TAM, arguably most dominant theoretical model, much of literature has made rather limiting assumptions presupposing a low number of direct effects on the adoption of technology. As a result, questions remain about the significance, relevance and sufficiency of variables central to some theories when posited against variables advanced by competing theories.

This chapter proposes a widening of perspective by developing a broader theoretical model, including most variables proposed by the most influential theories, and applying it in an empirical study of technology use by secondary education teachers in Romania. In doing so, we are not only widening the theoretical perspective, but contributing with results about an understudied country.

Section 2 of this chapter presents, what we consider are the main theories in the field, also the theories which are the basis of our model development. In Section 3, we are developing our own comprehensive model of technology adoption, explaining the categories and classes of variables, and variables themselves, down to the level of items of measurement for each variable (on which our questionnaire was based). Section 4 discusses data and measurement issues including application of questionnaire and data validity and reliability issues. In section 5, we discuss data analysis and interpretation. Finally, section 6 presents our conclusions.

2. LITERATURE REVIEW

We discuss what we believe are the five most important theories of technology adoption. Due to limitations of chapter length, we present them very briefly, focusing only on their contributions regarding individual adoption of technology and variables advanced.

2.1. Innovation diffusion theory (IDT)

Innovation Diffusion Theory (IDT) (see Figure 1(a), below) proposes a large number of individual level determinants of technology adoption/use (Rogers, 1983). These are: 1) the (perceived) *relative advantage* of innovative technology over its alternative; 2) *compatibility* of technology with one's values, experiences and needs; 3) technology's *complexity*, in as much it might be easy or difficult to use and understand; 4) *trialability*, the degree to which an innovation can be tried temporarily; 5) *observability*, extent to which an innovation use is socially visible.

Later research has re-conceptualized and added to the individual level determinants of adoption. *Personal innovativeness* has been conceptualized as a personality trait (Flynn & Goldsmith, 1993). The class of variables called by Rogers, *types of innovation decision* (see Figure 1(a)), has been redesigned as a unidimensional construct: *voluntariness*, defined as the "the degree to which use of innovation is perceived as being voluntary, or of free will". Similarly, *image*, defined as the degree to which using an innovation increases social approval of an individual, has been included in the IDT as an explanatory variable of adoption (Moore & Benbasat 1991).

IDT variables have found empirical support in various studies of information technology adoption/ acceptance (e.g. Leonard-Barton & Deschamps, 1988; Gharavi, Love, & Cheng, 2004; Agarwal & Prasad, 1997; Agarwal & Prasad 1998; Agarwal and Prasad 1999).

2.2. Theory of reasoned action (TRA)

TRA is a general theory of human behavior developed by Fishbein and Ajzen (1975; Ajzen & Fishbein, 1980). TRA states that reasoned / voluntary *behavior* depends on *behavioral intention*. The *intention* depends on: *attitude toward behavior*, and *subjective norm* – an individual's perception of social pressure to perform (or not) the behavior. These are seen as broader constructs determined each by more specific relevant *beliefs and evaluations* and *normative beliefs* (see Figure 1(b), below).

Several studies have found at least some evidence for the significance and relevance of TRA's attitude(s) and subjective norm in understanding technology use (e.g. Davis, Bagozzi, &Warsaw, 1989; Moore & Benbasat, 1996; Karahanna, Straub, & Chervany, 1999; Mishra, Akman, &Mishra, 2014). TRA, however, is probably more relevant in the study of technology adoption as a predecessor of the Technology Acceptance Model, and Theory of Planned Behavior.

2.3. Social cognitive theory (SCT)

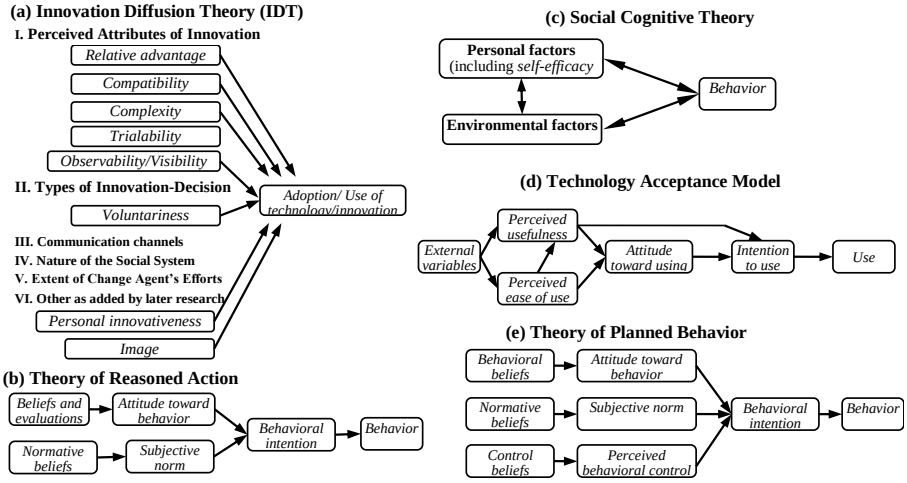
Developed by Albert Bandura (1982), the Social Cognitive Theory (SCT) (see Figure 1 (c), abaixo) main relevant contribution to technology adoption literature is the construct of *self-efficacy* defined as: "beliefs in one's capabilities to organize and execute courses of action required to manage prospective situations" (Bandura, 1997, p.2; Bandura, 1982). In addition, SCT emphasized the role of self-conscious emotions like *anxiety*. SCT and the *self-efficacy* variable were used quite extensively in empirical research of technology adoption in- or outside education. Many studies have found evidence for its significance and substantive relevance as a predictor of, either behavioral intention, or actual behavior (e.g. Hill, Smith, &Mann, 1987; Compeau, Higgins, &Huff, 1999; Igbaria & Ivari, 1995; Venkatesh & Davis, 1996; Holden & Rada, 2011).

2.4. Technology acceptance model (TAM)

Technology Acceptance Model (TAM) (see Figure 1(d), below) (Davis 1989; Davis, Bagozzi, Warshaw, 1989) builds on TRA by focusing exclusively on *attitudes* and ignoring *norms*. It assumes that information technology *use* (behavior) is determined by *intention* which at its turn is determined by a global *attitude* toward technology. Attitude is determined by two relevant specific attitudes: *perceived usefulness* of the technology to be used, and its *perceived ease of use*. All other variables are assumed as antecedents of these two variables.

Many studies have provided evidence for the predictive power of *use* and *intention of use* of technology in business (e.g. Szajna, 1994; Igbaria, Ivari, & Maragahh, 1995; Igbaria & Ivari, 1995) and in education (e.g. Yuen & Ma, 2002; Hu, Clark, & Ma, 2003; Teo, 2011), TAM having become the dominant theoretical model in the field. However, it has also come under criticism for: focusing on two explanatory variables and either failing to elucidate which are their antecedents (Benbasat & Barki, 2007); or failing to take into account alternative influences (Bagozzi, 2007).

Figure 1.
Main theories explaining technology adoption by individuals.



2.5. Theory of planned behavior (TPB)

The Theory of Planned Behavior (TPB) (Ajzen, 1985) (see Figure 1(e), acima), is an expansion of TRA. TPB adds the construct of *perceived behavioral control* (mainly based on *self-efficacy*) as a direct determinant of both behavioral *intention* and actual *behavior*. TPB found empirical support in a number of studies of technology adoption (e.g. Taylor & Todd, 1995; Koufaris, 2002).

3. TOWARD A COMPREHENSIVE MODEL OF TECHNOLOGY ADOPTION

We develop our model by constructing a typology of variables where categories and classes are distinguished based on theoretical causal mechanism and locus of measurement (for more details see Ogrezeanu, 2015). In constructing the classes of variables we build particularly on TPB. Once categories and classes of variables are developed we populate them with variables originating from the theories discussed but also from other research or our own additions.

At the highest level we distinguish between four *categories* of variables (all have been used explicitly or implicitly throughout the literature, but were never used systematically all four at once): 1) *attitudes/ beliefs* which can be related to the behavior, object of behavior or other relevant objects; 2) *psychological traits* – are somewhat stable psychological traits of individuals; 3) *social & sociotechnical context variables* are variables characterizing the social, institutional, technological context in which the individual acts; and lastly: 4) *bio-socio-economic-demographic-professional characteristics* of individuals.

Within the first category, following TPB we distinguish between three main types of (we term them all) *attitudes*: 1) behavioral attitudes, 2) normative attitudes/beliefs; 3) control attitudes/beliefs. However we depart from TPB in that we interpret them as *classes* of variables rather than single variables.[1]

In line with Vallerand and colleagues (Vallerand, 1997; Guay, Vallerand, & Blanchard, 2000), we consider that behavioral motivating attitudes are to be classified into: *extrinsic motivations* – i.e. aimed at outcomes of behavior, seeking beneficial outcomes and avoiding non-beneficial ones –, and *intrinsic motivations* – seeking pleasurable and avoiding unpleasable emotions during behavior performance. Within our model we consider among extrinsic motivations: *perceived usefulness* of technology (as defined by TAM) and *image* (as defined by IDT). Within intrinsic motivations, we consider *perceived ease of use* (TAM), *computer enjoyment* (Carroll & Thomas, 1988; Vallerand, 1997) , and *computer anxiety* (SCT; Igbaria, Pavri, & Huff , 1989; Compeau et al, , 1999). Within normative attitudes/motivations, we consider *compatibility* (IDT). Within control attitudes and beliefs, we include *computer self-efficacy* (from SCT and TPB) and *ICT skills*. With regard to the later, it is rather surprising that, while there is a broader literature and policy concern about the importance of *ICT skills* or *e-skills* for the knowledge economy (e.g. Allen & Velden, 2001; Statz 2001; European Commission 2010), few researchers have studied the effect of this variable within the technology adoption/acceptance literature (e.g. Leonard-Barton & Deschamps, 1988). Many studies have considered that the concept of skills is exhausted by *self-efficacy* (Igaria, Ivari, & Maragahh, 1995; Albion, 1999; Teo, 2009) or *computer experience* (Igbaria, Pavri, & Huff, Tabata & Johnsrud, 2008). We propose that this is a separate construct from *self-efficacy* and we introduce it as such in our study.

In addition to attitudes, we consider the category of *psychological traits*, be they *stable traits* also termed *personality traits* – where we include *personal innovativeness* (specifically *computer innovativeness*, as suggested by IDT), or semi-stable ones like *work satisfaction* (e.g. Mariani, Curcuruto, & Gaetani 2013).

Apart from the above classes, we propose a separate class of *sociotechnical (context) variables*. We include here: *technology access/availability, technical support availability* (both theoretically related to TPB and behavioral control but see Table 1 below for more exact references), *observability*, *voluntariness* (both from IDT). Broader social/institutional characteristics can be included such as: *school type*, *location type*, etc.

Finally, we consider the broad class of *individual bio-socio-economic-demographic-professional characteristics*. This includes *bio-demographics* such as *age* and *gender*. *Professional characteristics* including *teaching degree* (in Romania teachers advance, in order, from *"debutant"* to *tenured*, *degree II, degree I*), *teaching discipline* (our sample included the following classes: *mathematics, Information and Communication Technology* (ICT), *Romanian language and literature*, and *English language and literature*, *others*).

This typology, description of variables, their classes, categories, number of items, expected relationship with dependent variables, etc. are presented graphically in Figure 2. Further details about each variable's definition and items used in its measurement are given in Table 1, below.

[1] TPB was somewhat ambiguous in that it allowed for multiple variables in each class (e.g. various attitudes toward behavior, or subjective norms) but each was presumed to be antecedent to a single overarching attitude (e.g. attitude toward behavior, subjective norm (singular)) and all influence within each class were supposed to be mediated by that overarching variable. We pose that such presupposition is methodologically and substantively limiting, and whether such mediation occurs should be subject of empirical research rather than theoretical presupposition.

Figure 2.
Our comprehensive model of technology adoption.

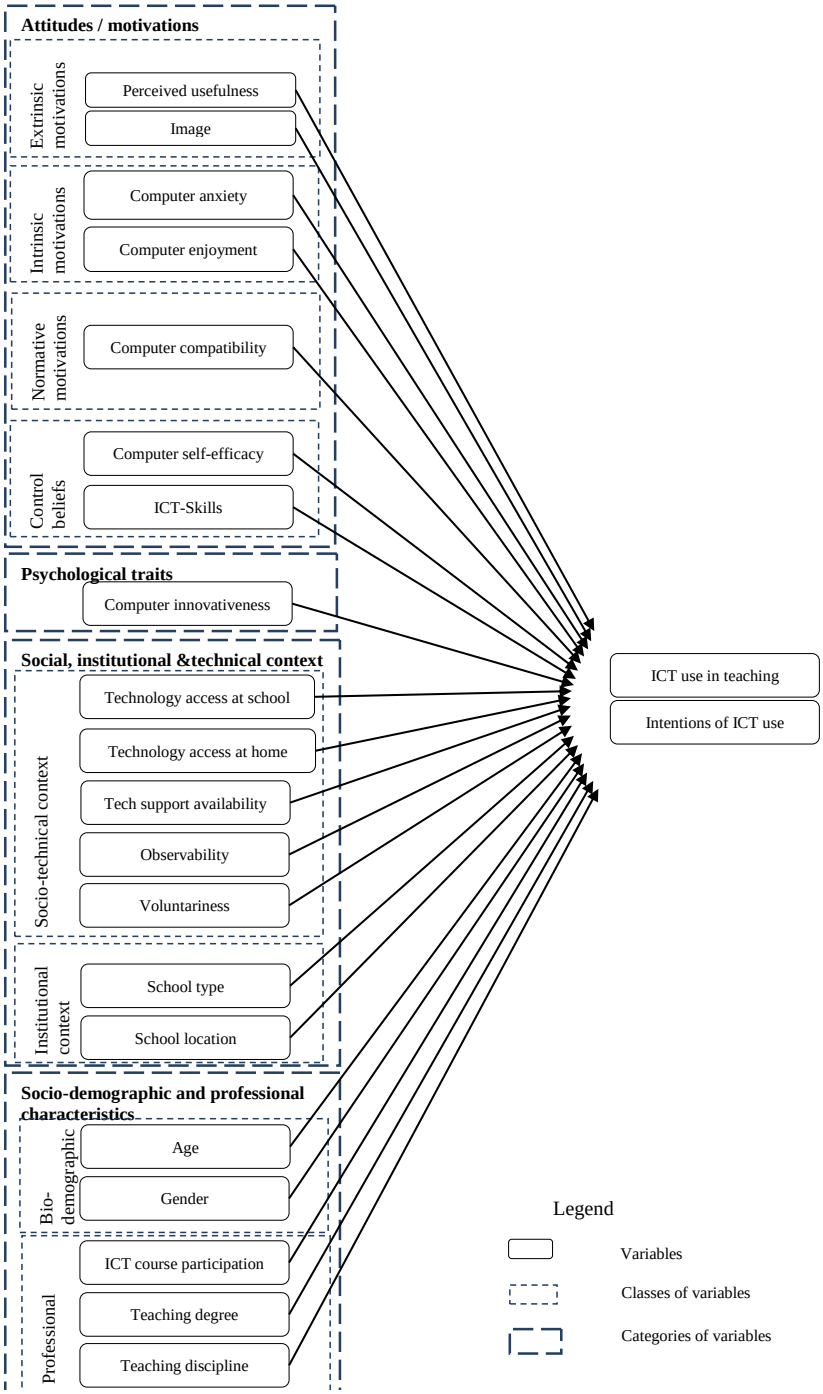


Table 1.
Description of model variables, classes, number of items and Cronbach's α.

Category	Class	Variable	Definition	Exp. relation	References	Items in questionnaire	Items No.	Cronbach α
Dependent variables	NA	*ICT use in teaching*	The extent to which teachers use a set of various ICTs in their teaching (computers, email, electronic documents, digital textbooks, video projectors, the Internet; elearning platforms)		Davis 1989; Davis et al. 1989.	Q15. On average how often do you?... 1. Use computers in relation to our activity. 2. Use email to communicate with pupils. 3. Use email to communicate with colleagues. 4. Print out teaching materials or tests. 5. Use computers in classrooms for teaching. 6. Use digital textbooks. 7. Use (other) digital materials. 8. Use video projectors in classes. 9. Ask pupils to use digital materials from the internet or sent by you for classes. 10. Use the Internet to prepare classes. 11. Use e-learning platforms (like AEL, Moodle, etc,) in classes.	11	.848
		Intention to use ICT in teaching	The extent to which a teachers intends to use ICTs in teaching in the future			Q22. How interested are you for the future to: (4 point scale) 1. To use ICTs in teaching activity. 2. To use digital textbooks in teaching activity. 3. To use auxiliary digital teaching materials. Q23. How probable do you think it is that in the next 5 years…? (5 point scale) 1. You would use ICTs in your teaching significantly more [than now]? 2. Use digital textbooks in your activity. 3. Use auxiliary digital materiasl in your teaching. Q24. How much do you want that in the future…? (5 point scale) 1. Use ICTs in your teacing activity significantly more. 2. Use digital textbooks in your teaching activity. 3. Use auxiliary digital materials in your teaching activity.	6	.934
Attitudes/ Motivations	Extrinsic motivations	*Perceived usefulness*	"the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989)	+	Davis 1989; Davis et al. 1989.	Q17. To what extent do you agree with the following statements: (5 point scale) 4. Using computers and the Internet makes /would make my teaching easier. 5. Using computers or the Internet increase/would increase the quality of my teaching activity. 6. Computers, computer programs and the Internet are useful in my teaching activity.	3	.885
		Image	"the degree to which adoption/usage of the innovation is perceived to enhance one's image or status in one's social system" (Karahanna et. al 1999)	+	Agarwal and Prasad 1997; Karahana et al. 1999.	Q19. How about the following statements? To what extent do you agree with them? 1. Teachers who use ICTs in their teaching have a better reputation than those who don't. 2. Teachers who use ICT in teaching are better appreciated by colleagues. 3. Teachers who use ICTs in teaching are better appreciated by pupils.	3	.897
	Intrinsic motivations	*Perceived ease of use*	"the degree to which a person believes that using a particular system would be free of effort" (Davis 1989).	+	Davis 1989; Davis et al. 1989.	Q17. (see general question above) 7. I find computers and the Internet easy to use. 8. I find using the computers and computer software easy to learn. 9. It is easy to make computers, computer programs, and other electronic equipment do what I need them to do.	3	.857
		Computer anxiety	"the fear of apprehension felt by individuals when they used computers or when they consider the possibility of computer utilization" (Simonson et al. 1987).	-	Igbaria et al. 1989; Compeau & Higgins 2008; van Raaij and Schepers 2008	Q19. See general question above. 7. I feel an apprehension toward using ICTs in my work. 8. I am afraid to think wi could destroy documents I work on by pressing the wrong key. 9 I find computers quite intimidating.	3	.772
		Computer enjoyment	The extent to which individuals enjoy working with computers.	+	Teo 2007; Carroll and Thomas 1988; Davis at al. 1992	Q18. How about the following statements? To what extent do you agree with them (5 point scale) 4. Using computers and computer programs is/would be pleasant. 5. I feel well when I use computers and computer programs. 6. I anticipate with pleasure those aspects of my work which involve the use of computers and computer programs.	3	.914

	Normative beliefs/ motivations	*Computer compatibility*	The degree to which information technologies are perceived as consistent with a teacher's teaching discipline, methods and workstyle.	+	Rogers 1983; Moore and Benbasat 1991;	Q18, See general question above. 1. using ICTs is compatible with the discipline(s) I teach. 2. Using ICTs fits well with my workstyle. 3. Using ICTs fits well with my teaching methods.	3	.921
	Control beliefs / abilities	*Computer self-efficacy*	The beliefs in one's capacity to execute [work related] courses of action related to computers/technology.	+	Bandura 1982; Hill et al. 1987; Compeau and Higgins 1995	Q20. How about the following statements: To what extent do you agree with them? 7. I have the capacity to use various ICTs effectively in my work. 8. If I want to use ICTs in various aspects f my work I am confident that I can use them without problems. 9. If I want to certain results in my work by using ICTs, I am confident I can obtain them.	3	.902
		ICT Skills (or literacy)	The ability to use the computer, related hardware and computer software.	+	Simonson et al. 1987; Tondeur et al. 2008.	Q3. How would you assess your abilities to do the following activities related to computer use? (6 point scale) 1. I can work with files and documents (create, save, rename, delete, search) 2. I can use a text editor (like Word, Open Office Writer, etc.). 3. I can use a presentation program (like PowerPoint, Open Office Impress, etc); 4. I can use a spreadsheet program (e.g. Excel, Open Office Calc, etc.). 5. I can use/read non editable PDF documents. 6. I can use/read eBooks. Q4. Can you perform the following technical activities? 1. Installing a new computer. 2. Installing a new printer, scanner or other peripherals (video projector, webcam, external storage equipment, etc.) 3. Connecting a computer to a local netwok (wired or wireless); 4. Installing software applications. Q5. Can you…? 1. Use email. 2. Search on the Internet (using Google, Wikipedia, etc.). 3. Read blogs. 4. Write/post online, on a blog, Wikipedia, forums. 5. Use social networks (like Facebook, MySpace, etc.)\ 6. Download files .7. Make voice calls on the Internet (Skype, MSN, etc.)	16	.905
Psychological traits	Stable/ Personality traits	*Computer innovativeness*	The willingness and propensity of an individual to try out novel, possibly risky courses of action and technologies.	+	Flynn 1993; Agarwal and Prasad 1998.	Q17. See general question above. 1. I usually experiment with new approaching and ICT tools in my teaching. 2. I like to be among the first to use new ICTs. 3. I prefer to let others confront the difficulties of implementing new methods and techniques based on ICTs before I use them.	2	.884
	~~Semi-stable traits~~	~~*Work Satisfaction*~~	Reported satisfaction with work	+	Mariani, Curcuruto and Gaetani 2013.	Q20. See general question above. 4. I am generally happy with work conditions in my school. 5. I am generally satisfied with my work. 6. I am generally satisfied with my salary.	3	~~.510~~ **
Social and sociotechnical context	Socio-technical context	*Technology access at school*	The extent to which the individual perceives to have access to technology at work/school.	+	Becker 2000; Mathieson, Peakock and Chin 2001; Teo 2009	Q8. How available for work are the following technology types in your school? 1. \Computers in classrooms 2. Computers in computer labs. 3. Digital textbooks, 4. Auxiliary teaching materials and digital content. 5. Printers. 6. Video projectors 7. Internet connection in the classrooms. 8. Internet connection in computer labs. 9. Fax machines. 10. e-learning platforms	10	.789
		Technology access at home	The extent to which the individual perceives to have access to technology at home.	+		Q6. Which of the following equipment are found in your home?... 1. Personal desktop computers 2. Laptop computer 3. Tablet.	8	~~.564~~ , .845 **

						4. Printer. 5. Scanner. 6. Smartphone. 7. Landed Internet connection. 8. Mobile Internet connection.		
		Tech support availability	The extent to which a teacher perceives to have technical support available at school.	+	Becker 2000; Mathieson ; Teo 2009	Q11. Is there any person in your school specialized in and paid for offering support to teachers in using computer or other electronic equipment? Q12. From your experience, how available is this person. Q14. Are there colleagues, teachers who are good with computers, who you can ask for support in using computers and other equipment?	3	.863
		Observability	The degree to which ICTs are observable by teachers among relevant colleague teachers.	+	Rogers 1983; Agarwal and Prasad 1997.	Q19. See general question above. 4. In our school there are many teachers who use ICTs in their teaching. 5. Generally, in the teaching community in Romania I notice that teachers use ICTs often. 6. In my teaching discipline I often encounter teachers who use ICTs.	3	.801
		Voluntariness	The degree to which the use of ICTs is perceived as voluntary, of free will.	+	Moore and Benbasat 1991; Agarwal and Prasad 1997	Q20. See general question above. 1. The school leadership requires/encourages the use of ICTs by teachers. 2. School inspectorate in the county I work requires/encourages the use of ICTs by teachers. 3. The National Ministry of Education requires/encourages the use of ICTs by teachers.	3	.849
	Social/ institutional context	*School type (by education level)*	Refers to the education level (by ISCED classification), whether (in our sample) lower secondary education (ISCED 2) or upper secondary education (ISCED 3).	+	UNESCO & UNESCO Institute for Statistics 2012	Q32. Type of educational institution you work in (5 categories specific to Romanian educational system – recoded then into two ISCED categories)	1	NA*
		School location	Location as to whether within Bucharest or outside.	?		Q28. In which locality is the school you work in? (recoded as a dummy after)	1	NA*
Socio-demographic and professional characteristics	Bio-demographic characteristics	*Age*	Respondent's age	-	Dykk and Smitter 1994; Venkatesh et al 2003.Parasuraman and Igbaria 1994.	Q26. Year of birth	1	NA*
		Gender	Respondent self-reported gender	?		Q25. Gender/sex	1	NA*
	Professional characteristics	*ICT course participation*	Number of ICT courses to which responded participated in the past.	+		Q21. How many courses in ICTs and e-learning, of the following types, have you participated in?... 1. Courses financed by HRDSOP (a human resource development structural funds program) 2. University or post-university courses. 3. AEL courses (AEL a governmental program and e-learning platform? 4. Courses at the Teachers' Houses (county level institutions).	4	.529 **
		Teaching degree	In Romania, teachers advancement in career takes place on 4 levels from "debutant" (entry level) to "tenured", "degree II", and degree I.	?		Q30. What is your teaching degree?	1	NA*
		Teaching discipline	Our samples included teachers of the following disciplines: mathematics, Information and Communications Technology (ICT); Romanian language and literature; English language, Others	?		Q29. What disciplines are you teaching, in decreasing order of hours taught?	1	NA*

* not available due to measurement using one item only; ** see discussion in text, Section *4.*

4. DATA AND MEASUREMENT

Data for this study was collected by means of a questionnaire filled by participants to the "MAGISTER Educational Forum"[2], in Bucharest, on March 17-19, 2015. The theme of the questionnaire was the use of technology and various attitudes toward technology (many of which are discussed in this paper as determinants of technology use). Most questions of the questionnaire are presented in

Table 1, acima. Out of 1209 participants, 845 valid questionnaires were returned, for a response rate of 69.8%. Respondents were secondary education teachers aged between 24 and 70 (mean 43.3 years), predominantly female (92%), mostly from schools in Bucharest (82%). It should be noted that in focusing our empirical work on Romania we are adding to only a couple of contributions to the field studying this country (Nistor, Wagner, Istvanffy, & Dragotă, , 2010; Ogrezeanu & Ogrezeanu 2014).

Most variables were measured with multiple items/indicators, as displayed in

Table 1, acima. Cronbach's α test revealed high values, well over .7 (usually over .8 with some over .9), for most variables (see

Table 1, last column).). Three variables had lower α, at around .5. To deal with low reliability scores we followed Bollen and Lenox's distinction between *cause* and *effect* indicators, and their recommendations (Bollen, 1984; Boolen & Lenox, 1991). Where indicators were considered strictly as effects of the latent construct they are measuring, like *work satisfaction*, the internal consistency requirement was considered high. Failing to meet the .7 threshold meant that the variable was dropped out of the study. In the case of ICT access at home, indicators were considered at least partially causes of the latent construct and some items were considered alternatives to the realization of the same function, such as owning laptop and owning desktop computers. In this case, α was recalculated between a new indicator (sum of owning laptop and desktop) and the rest resulting in a high value .845, therefore the variable was kept in the analysis. Finally where all items were considered as alternative causes/constituents of the latent variable, like in the case *ICT course participation*, the requirement of high internal consistency (high α) was dropped and the variable kept as such in the study, despite it not meeting the .7 threshold.

The Campbell and Fiske (1959) test for discriminant validity was calculated for each pair of multi-item variables. Only in the case of one pair it revealed a value above .85 (namely .881, corresponding to r =.808) for *Computer enjoyment* and *Compatibility*. Since the two were deemed semantically quite different, and since the sample we used was quite large, we kept them in the analysis, making note to pay extra attention to possible multicollinearity in the analysis phase.

We identified 1.8% missing values which were imputed using the EM procedure in IBM SPSS.

In the case of *ICT course participation* a nonlinear transformation (square root) was operated to reflect decreasing marginal effects and compensate for positive skewness and high kurtosis.

[2]Event organized by *Niculescu Publishing House*, see Acknowledgements section..

5. DATA ANALYSIS AND INTERPRETATION

Data analysis was carried out using IBM SPSS 23 using Ordinary Least Squares (OLS) analysis. Results are presented in Table 2, abaixo. OLS was considered the method of choice due to the fact the dependent variables (intention and use) were operationalized as indexes of several items, this giving them a quasi-continuous character.

Our models for *intentions* and for *use* explain and very similar and large proportion of variance, close to 60%. This is an exceptionally high goodness of fit for individual level behavioral models in general and for technology adoption models in particular, especially in the context of a purely linear model with no interactions among variables. This indicates that the large number of variables may be a good approach to improving the explanatory power models.

One of the most striking aspects of our results is that the significant variables for *intentions* are quite different from those for *use*. In fact, usually variables significant in one model are insignificant in the other. The only exceptions are *ICT access* both *at school* and at work, but even in these cases the findings are heterogeneous. While these variables are highly significant and relevant in the *use* model, they have small influences in the *intentions* model (and surprisingly access at school has a negative direct effect on *intentions*, indicating a mechanism whereby low access indicate high desire/intentions for future more use and high access, low desire for additional use). Thus, *intentions of use* are mainly explained by "psychological" motivations: intrinsic motivations like *computer enjoyment*; normative motivations like *compatibility*; and extrinsic motivations like *perceived usefulness* and *image*. Actual *ICT use* is explained primarily by "capability", "opportunity" and social factors such as *ICT skills*, *ICT access* (both *at school* and *at school*) and *observability*. This finding is more surprising in the case of behavior than intentions, since in the former's case psychological motivating attitudes, the main direct determinants advanced by the various theories discussed, seem to "drop out of significance" in the case of explaining the *use* behavior.

Our findings also show that both behavior and intentions are more complex (than some models suggest – especially based on TAM – with at most 1, 2 or three other variables). Both models show a number of 10 direct determinants that are significant while also a large number (17-18) of variables are also rejected (as insignificant). This rejects TAM's assumption that there are only two direct determinants of intentions to use and behavior: *perceived usefulness* and *perceived ease of use*, and that all other variables are to be considered as their antecedents. Our analysis based on two comprehensive models suggests that there are plenty of other direct determinants of ICT use and behavior. In fact the two TAM predictors are not the most important. *Perceived ease of use* is insignificant (as direct determinant) in both models, while *perceived usefulness* is significant only in the model of intentions, having the 3rd most explanatory power in that model.

Table 2.
Regression analysis results.

		Dependent variable: ICT use in work (teaching)					Dependent variable: intention to use ICT in teaching				
		B	***SE***	***β***	***t***	***p***	***B***	***SE***	***β***	***t***	***p***
Constant		-0.068	0.230		-0.297	0.767	0.755	0.211		3.585	0.000
ICT use in teaching							0.047	0.032	0.051	1.456	0.146
Perceived usefulness		0.054	0.035	0.051	1.523	0.128	0.159	0.032	0.166	4.937	0.000
Image		0.004	0.020	0.005	0.208	0.835	0.082	0.018	0.116	4.593	0.000
Perceived ease of use		-0.034	0.034	-0.037	-0.983	0.326	-0.004	0.032	-0.005	-0.137	0.891
Computer anxiety		-0.010	0.023	-0.012	-0.458	0.647	-0.015	0.021	-0.019	-0.720	0.472
Computer enjoyment		-0.030	0.038	-0.034	-0.770	0.441	0.203	0.035	0.253	5.768	0.000
Computer compatibility		0.040	0.035	0.049	1.125	0.261	0.140	0.032	0.191	4.342	0.000
Computer self-efficacy		0.008	0.030	0.008	0.262	0.793	0.092	0.028	0.105	3.326	0.001
ICT Skills (or literacy)		0.194	0.026	0.266	7.390	0.000	0.014	0.025	0.021	0.572	0.568
Computer innovativeness		0.158	0.024	0.216	6.629	0.000	0.016	0.022	0.024	0.704	0.482
Technology access at school		-0.539	0.047	-0.295	-11.449	0.000	-0.098	0.046	-0.059	-2.108	0.035
Technology access at home		0.065	0.011	0.139	5.751	0.000	0.026	0.010	0.063	2.529	0.012
Tech support availability		-0.024	0.018	-0.033	-1.379	0.168	-0.014	0.016	-0.020	-0.851	0.395
Observability		0.095	0.024	0.115	4.022	0.000	0.003	0.022	0.004	0.139	0.889
Voluntariness		-0.033	0.023	-0.039	-1.478	0.140	-0.028	0.021	-0.035	-1.337	0.182
School type:	*Lower secondary*										
	Upper secondary	0.120	0.035	0.082	3.395	0.001	0.010	0.033	0.007	0.307	0.759
	Other	-0.264	0.098	-0.061	-2.699	0.007	-0.049	0.090	-0.012	-0.544	0.586
School location	*Bucharest*	-0.030	0.045	-0.016	-0.661	0.509	-0.035	0.041	-0.020	-0.851	0.395
	Other										
Age		-0.001	0.002	-0.018	-0.599	0.549	-0.005	0.002	-0.068	-2.214	0.027
Gender		-0.007	0.062	-0.002	-0.106	0.916	-0.022	0.057	-0.009	-0.391	0.696
√ICT course participation		0.025	0.019	0.032	1.335	0.182	0.043	0.017	0.060	2.465	0.014
Teaching degree	*Beginner*	-0.033	0.077	-0.012	-0.431	0.667	-0.075	0.071	-0.030	-1.064	0.287
	Tenured	-0.100	0.048	-0.057	-2.108	0.035	-0.014	0.044	-0.009	-0.322	0.748
	Degree II	-0.061	0.049	-0.031	-1.232	0.218	-0.018	0.045	-0.010	-0.394	0.694
	Degree I										
Teaching discipline	*Mathematics*	-0.199	0.042	-0.125	-4.689	0.000	0.056	0.039	0.038	1.423	0.155
	ICT	0.274	0.068	0.100	4.032	0.000	0.037	0.063	0.015	0.587	0.557
	Romanian										
	English	0.060	0.043	0.038	1.398	0.162	0.084	0.039	0.057	2.124	0.034
	Other	0.075	0.050	0.034	1.507	0.132	0.011	0.046	0.005	0.242	0.809
Overall model statistics	*N*	845					845				
	R^2	.612					.611				
	Adjusted R^2	.599					.598				

6. CONCLUSIONS AND DISCUSSION

Our analysis validates the need for and usefulness of comprehensive, inclusive models of technology adoption in education. Our models accounted for 60% of variation in the dependent variables *ICT use* and *intentions to use*. However, more importantly, in presenting significant results about the direct effects of some variables we have the added advantage of having controlled for other variables proposed by competing theories, thus lowering the risk of omitted variable bias.

We found that most relevant predictors of intentions are psychological, motivations such as *computer enjoyment, compatibility, perceived usefulness, image*, while actual *use* behavior is mainly a function of capability (*ICT skills*) opportunity (*ICT access at work/school* and *at home*) and social influence of peers (observability). The heterogeneity of findings concerning *intentions* versus actual *behavior* may indicate the need for further theoretical effort to provide separate explanations for the two. Finally, our findings suggest that the principal TAM variables are not the main direct predictors of *ICT use* and *intentions of use*, therefore we suggest that the research should renounce this assumption of TAM that the two mediate all other influences.

From the practical standpoint of education management and policy, there are several actionable conclusions we can draw. The use of computers by teachers does seem to depend mostly on their *access* to technology and their *ICT skills*. While both are rather intuitive findings, neither is trivial. Access means existence of not just computers in computer labs but their access possibly in classrooms, access to various software, projecting and printing equipment, etc. Moreover, access means not only equipment's existence as school endowment, but actual ease of access by teachers, i.e. sufficient numbers and procedurally easily accessible. It is also important to talk of *ICT skills* as specific skills and not just as the broader concept of *computer self-efficacy*. In other words, to support computer use by teachers, educational managers and policy makers have to make hardware and software technologies available (hopefully according to a technology in education use plan) and insure that teachers have the specific skills to use those specific technologies.

Furthermore, in terms of motivating teachers to use technology, the triad: *enjoyment, compatibility* and *usefulness* (in this order) has to be kept in mind. A correct model of technology use means technologies are made enjoyable by teachers, teachers are trained, not only to acquire technology specific skills but an understanding of how those technologies are compatible (i.e. can be integrated) with their discipline and methods, and finally how they are useful from a effectiveness and efficiency point of view. Finally, it is important to note that there is a social snowball effect reinforcing information technologies use in education: observing that other use technology, as well as one's reputational gains from technology use may reinforce further technology use. As such, educational managers can encourage technology related social interaction among teachers such as: seminars, courses, events related to technology in education, thus facilitating both learning and mutual encouragement.

Our study was limited to a sample of teachers in Bucharest, Romania. Whether any aspects of the findings are generalizable in any way should be subject of further studies of using, like this one, broad ranges of explanatory variables, in other contexts. Our findings are also limited to direct effects on ICT adoption. Variables found significant are prime candidates to be considered as having such direct effects. However, having found some variables insignificant suggests that they have no direct effects but does not rule them as irrelevant. They may have relevant indirect effects as antecedents of direct effects. We are currently working on exploring such indirect effects. In doing so we see the benefit of proceeding from large number of variables direct effect studies, like this one, and studying the antecedents of significant direct effects, instead of limiting our focus to the antecedents of TAM variables.

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KEY TERMS & DEFINITIONS

Technology adoption: in the context of this article refers to the process by which individuals decide (with some degree of permanence) and live by that decision to use a specific technology or type of technology. In our context we refer to information technology in particular. Research of technology adoption at individual level has focused on either intentions to use technology or the actual use, or both. Therefore, is often used as a generic term for both intentions to use technology and actual use. Some authors prefer to use *technology acceptance* with the same meaning, but largely the two terms adoption and acceptance have been used interchangeably. Technology adoption at individual level is quite different from technology adoption at group or organizational level where adoption may mean more than just individual use but organizational decisions, purchase of technology, development and deployment, and finally user take-up.

ACKNOWLEDGEMENTS

We would like to thank Niculescu Publishing House, and in particular to Prof. Dr. Cristian Niculescu and Dr. Andrei Niculescu, for their support and permission to collect data by means of a questionnaire at the event "MAGISTER Educational Forum" organized by them. Without their support the collection of a large number of completed questionnaires may have been impossible, which would have made this study in this form impossible.

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Chapter #9

MASTER DEGREE STUDENTS' PROPOSALS AND OPINIONS ABOUT INNOVATION IN THE SECONDARY EDUCATION IN SPAIN[1]

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ABSTRACT
This present paper describes the research carried out in the subject of the *The University Master's Degree for Secondary Education, Vocational Training and Language Teaching* at the University Jaume I (Castellón, Spain): 'Teaching Innovation and Introduction to Educational Research' in the specialty of Language and Literature and Language Teaching. 245 students were enrolled in this subject. As part of the subject´s assessment, students were asked to work in groups in order to write a research proposal divided into two main parts: (i) theoretical background (definition of innovative teaching, main trends and authors and some examples of innovative projects), (ii) students define the innovative tool/resource they have chosen (e.g. blog, podcasts, digital books, Mahara, fakebook, etc.) and design a didactic unit using this virtual tool. In this paper, we analyse the virtual resources chosen by our students and reflect on their feelings and opinions about the implementation of these new innovative materials in a real secondary school classroom. Results show that these innovative tools can help secondary school teachers to enrich and improve the teaching/learning methods by supporting the traditional methods but, by no means, substituting it; however not all our students think about the possibility of implementing them.

Keywords: secondary school education, master´s degree students, innovative resources.

1. INTRODUCTION

The University Master's Degree for Secondary Education, Vocational Training and Language Teaching allows students to consider what education is during the educational period involved. It is open to students from various degree courses, many of which are not related to teaching, although all students will have their own educational experience in the past. It is necessary to shape the idea of teaching that each of us has into that of a thoughtful teacher who does not act on impulse or intuition – or at least not always – and who incorporates reflection in their professional activity, together with the appropriate skills and knowledge. The master program includes training of 60 ECTS credits. It is a complete training structured around specific (for each of the specialties offered), and general subjects (psycho and socio-pedagogical field) and end module, including the Practicum, that is, the subject that provides for closer links with secondary schools, and the Master PhD Final Dissertation, aiming to be an opportunity for students to make a critical and reflective synthesis of the teaching / learning lived in the Masters and specialty enrolled. External internships or Practicum is a period of eight weeks teaching (a total of 200 hours) that all

[1] Research Project: P1.1A2014-02, codi comptable 14/308
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students on the Master´s programme must be performed in secondary schools in the province of Castellon. In them there is a moment of reception by the centre where the organization of the educational community, an observation period with the assigned tutor and a period of intervention. The Practicum is done in the specialty of the Master that the student is enrolled. Master PhD Final Dissertation is done as a final step of the Master studies.

Many studies have been directed to research how the integration of technology into the curriculum may enhance language teaching and learning (Wong 2004; Miner, 2004; Brodskaya, & Thiele, 2004; Timucin, 2006; Eugene, 2006; Hixon, 2008). Most of those studies shared a common finding that is related to the effectiveness of the use of technology in education and how it assists in developing teaching methods and students´ knowledge (Frigaard, 2002; Schofield, & Davidson, 2003; Miner, 2004; Timucin, 2006). The use of technology in order to help in the teaching/learning process is becoming an increasingly important part of higher and professional education (Wernet, Olliges, & Delicath, 2000). However, in schools, teachers are seen to be active instruments in the process of changes and implementation of new ideas as their beliefs and attitudes may support or impede the success of any educational reform. (Woodrow, 1991; Levin, & Wadmany, 2006). The technical advances of information technology have also had a great impact on English language learning and they increase students´ motivation, according to Mansor (2007).

2. OBJECTIVES

The objective of this paper was to make students, enrolled in the Master´s Degree, aware of the importance of implementing new technologies in the secondary school classes in order to innovate and renovate the traditional teaching methodologies. We did not pretend to replace them but to complement them by adding some innovative methods. Students designed projects in this very same line, and gave their opinions and feelings about the possibility of implementing their projects in a current secondary school class.

3. METHOD

3.1. Participants

The participants were 245 students enrolled in the subject Teaching Innovation and Introduction to Educational Research in the Master's Degree in Teaching of Compulsory Secondary Education, Vocational Training and Language Education in the specialty of Language and Literature and Language Teaching course.

3.2. Description of the subject

It is one of the three theoretical subjects of each specialization of the Master in Teaching of Compulsory Secondary Education, Vocational Training and Language Education. It consists of 8 ECTS credits of a total of 200 hours of student work. The subject is compulsory for the students of the Master´s Degree and is developed intensively for four weeks. The importance of this subject in the formation of secondary teachers is the need that teachers have to confront and respond to the changes that have occurred in recent decades in society and for traditional teaching methods have shown be unsuitable or less insufficient. All these aspects are discussed in this subject from three general groups: innovation, research and evaluation, which will be taught from a generic and multidisciplinary perspective in the first half and will be applied specifically in the field of specialty in the second part.

3.3. Project

Students, in groups, had to write a project clearly separated in two parts:

- Theoretical Framework
  - Definition of Teaching innovation
  - Main authors and trends
  - Examples of teaching innovation projects

- Proposal
  - Choosing a resource for innovation (Blog, Mahara, Digital Book, Edmondo…)
  - Theoretical explanation of the chosen resource
  - Project proposal (didactic unit with the use of innovative resource/tool)
  - Description of the students
  - Proposed activities

Once students had delivered their project, they had to present it in front of the class so that their classmates could learn from their peers and can get a wider and/or different perspective.

3.4. Questionnaire

Then, students were asked to answer the following three questions in order to get their opinions and feelings about the possible implementation of their projects in a secondary classroom:

1. After your practical classes in an actual secondary school, do secondary school students/ teachers make use of the new technologies in their classes in order to learn English as a second language?
2. Do you think your didactic proposal/project could be implemented in a real classroom? Why/why not?
3. Do you think you can be an innovative teacher in the actual educational system in Spain?

4. RESULTS

4.1. Proposals

Working groups were formed as noted in the table 1 (some groups of students enrolled in the specialty of English and some groups of students enrolled in the specialty of Spanish). After that, they had to explain and describe the virtual resources chosen. These virtual resource are presented below.

Table 1.
Students of the subject teaching innovation and introduction to educational research.

English	Spanish
EDMONDO	**THE INTERVIEW IN A BLOG**
FAKEBOOK	**LITERATURE FAKEBOOK**
WORDPRESS AND HOT POTATOES	**VLOG**
PODCASTING	**DIGITAL BOOK**
MAHARA	**JOURNALISTIC BLOG**
PODCAST	**BLOG**

4.1.1. Edmondo

Edmodo allows communication between students and teachers as a microblogging, in a closed and private environment. It was created in 2008 by Jeff O'Hara and Nic Borg, although a few years ago it was acquired by Revolution Learning. The project is available in Spanish and in seven other languages. In effect, Edmodo, is an educational social platform totally free, without any additional cost.

Figure 1.
Edmondo screenshot.

Edmodo allows to:

• Have a space of communication between the different roles through messages and alerts.

• Manage the grades of our students.

• Share various multimedia resources: files, links, videos, etc.

• Create private groups with limited access to teachers, students and parents.

• Launch student surveys.

• Allocate tasks to students and manage their grades.

• Manage a class calendar.

• To create communities where all the teachers and students of schools can be grouped together.

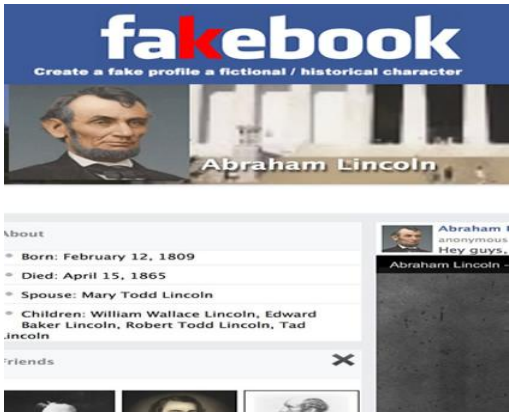
• Access via mobile devices (iPhone and Android).

The fact that a group of students can work together on the same online platform encourages interaction, cooperation and teamwork, as well as emphasizing the good use of new technologies.

4.1.2. Fakebook

Fakebook is an innovative resource used to create profiles on said social network for educational purposes. For instance, you can design the resource as a historical character, a celebrity, a famous writer or a musician. Fakebook is a free tool that anyone can access through the following website: w ww.classtools.net.

Figure 2.
Fakebook screenshot.

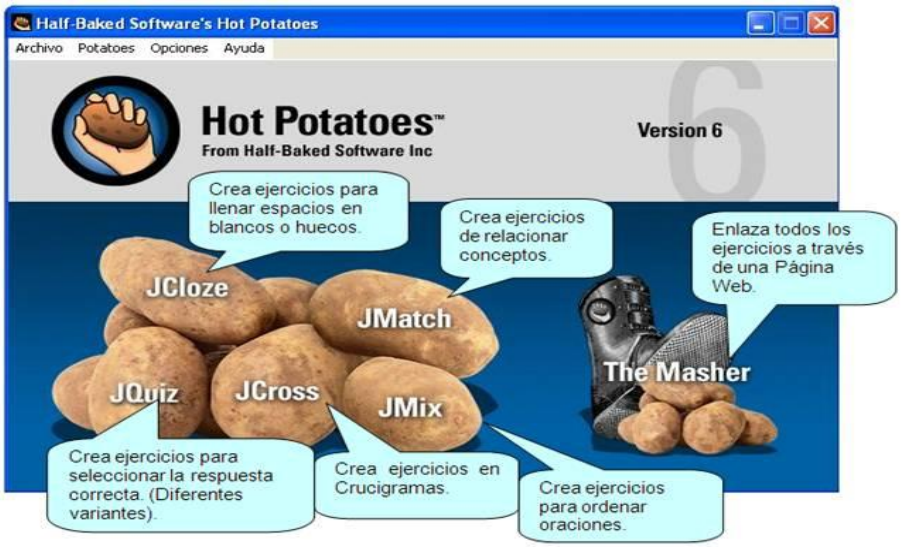


The first thing teachers have to do is choose a name and an image (using Google Images). You can also put a background that appears behind the profile photo and name. Next, it is important to complete the section where you can add personal information about the character you choose, as well as the date of birth, and the family. There is another section used to add contacts, enemies, family, or any other group of people who want to classify by another name. And finally, teachers can create an entry in relation to the character. They can upload links to videos and other web pages. It is an excellent tool to join English reading and writing.

4.1.3. Hot Potatoes

The Wordpress tool is a web publishing system with entries sorted by date. It is a platform that allows you to write, modify articles and create a web page or blog. It is an easy way to share information without worrying about writing codes. This was the reason for our choice because it allowed us to design our WQ project easily and simply. It is very versatile and, in addition, it is very easy to introduce activities created with the application Hot Potatoes. Hot Potatoes is a tool that increases the exposure time and interaction of students with the target language, increasing their motivation and their language skills. It could be defined as a program package that includes six modules called potatoes that allow to create different types of interactive multimedia exercises (Arneil, Holmes, & Street, 2001). Examples of activities would be multiple-choice questions or open-ended questions that include the possibility of self-correction. Therefore, it should be noted that this program promotes students' autonomy and critical thinking.

Figure 3.
Hot Potatoes screen.



4.1.4. Podcasting

Podcasting consists of creating and publishing digital audio and video files on the Internet so that they can be downloaded and / or heard by students. These files are called podcasts and the format in which they are normally distributed is an MP3 format. Something important is that they can be heard both on the computer and on an mp3 player, iPod type or another that plays these types of files. The student can create his own material, as evidence of his learning.

During the last few years, creating or recording sound files and disseminating them on the Internet so that they can be downloaded and listened to whenever the user wants in an audio player, and applying them in some didactic models has been able to achieve better results in the learning of social, historical, political contents, etc., and in the acquisition of competences of the language such as oral comprehension, reading, oral expression, etc.

Taking into consideration that the podcast is one of the applications that facilitate the maximum interaction between the users of the Internet, we can locate a great amount of podcasts oriented to the learning of practically all the subjects. The use of the podcast is to publish, express and give opinions, seek and receive information of interest, collaborate and create knowledge is more oriented as a teaching resource many more effective to achieve a certain result.

4.1.5. Mahara

According to this website Mahara.org (2016), 'Mahara is the perfect personal learning environment mixed with social networking, allowing you to gather, reflect and share your achievements and development online and in a space you control.' Through a simple interface, users can develop this virtual portfolio in which there is not only the possibility of sharing information, but of interacting with it. That is, when a student publishes in his portfolio, everyone else will have access to that information and insert comments about it.

Mahara belongs to the Web 2.0 or social web. This term defines those online pages that are governed by "two fundamental principles closely linked: collective intelligence and participation architecture". The first is that the sum of knowledge of each individual constitutes a corpus of knowledge, creating a collective work. That is, a student shares his own essays in Mahara, so that the rest can read them; it is a fact that enriches collective knowledge. The second principle of Web 2.0 refers to the participation of the entire user community. That is, the feedback (comments and ideas) by some students to others.

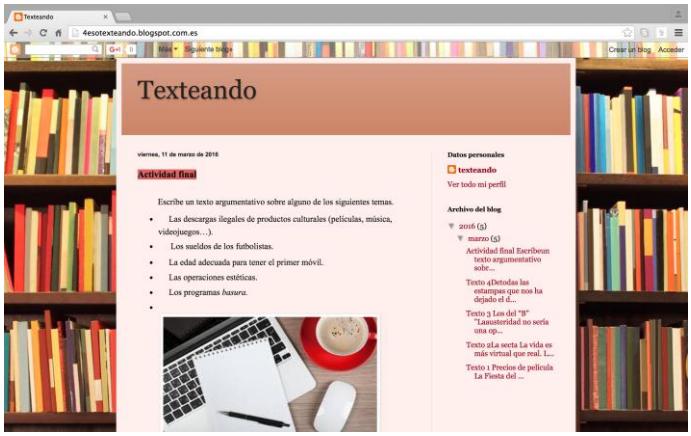
Figure 4.
Mahara screenshot.

4.1.6. Blog

A Blog is a personal space for writing on the Internet in which the teachers publish articles or news (post) in which they can include text, images and links. Updating the contents of the Blog is not complicated for the user, as it is done through the web from the browser itself and without the need to use any auxiliary program.

Originally blogs were intended to be used as online journals to inform, share, and periodically discuss the things that the author deemed appropriate, but a blog can become much more than a newspaper and has several applications that can be used in our secondary education.

Figure 5.
Example of blog designed by the students.



4.1.7. Digital Book

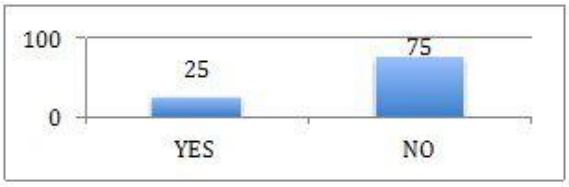
It is an environment where to share and show the students´ work. Students can create their stories and share them with the teacher and their classmates. It is a resource in the form of a book or notebook, similar to books on paper but in electronic format where anyone can add chapters or documents. The digital book has been developed with *FlippingBook Publisher Trial*, an application that can be downloaded for free and allows you to add any file as long as it is in pdf format, also multimedia files can be added.

Figure 6.
Digital Book screenshot.

4.2. Opinions

4.2.1. After your practical classes in an actual secondary school, do secondary school students/ teachers make use of the new technologies in their classes in order to learn English as a second language? Which ones?

Figure 7.
The use of new technologies in the secondary schools.

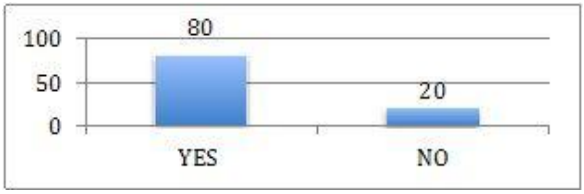


75% of the students affirmed that, in the secondary schools where they were doing their internships did not use any kind of technological resource or virtual resource or tool. Although some assured there are some technological resources in the centres such as digital boards, projectors, computers, teachers do not use them in their classes.

The other 25% said that some teachers in the secondary schools made use of digital boards and some encouraged their students to use some digital resources such as the Powerpoint to present some classroom works.

4.2.2. Do you think your didactic proposal/project could be implemented in a real classroom? Why/why not?

Figure 8.
Students´ intentions to implement their projects.

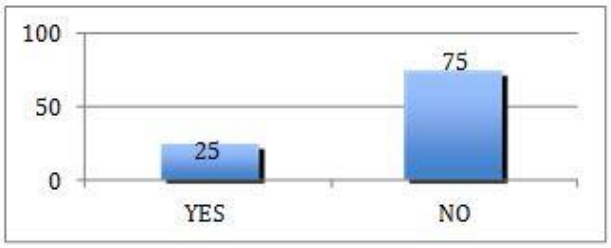


Most of the students, 80% of them, answered that they would like their projects to be implemented in an secondary school class and some of them answered that technological resources are not used in the secondary schools but if there were, they would use them and encourage their students to do the same.

The rest of our students, 20% of them, said they would not like to implement their projects as they said it would be impossible in their current secondary schools.

4.2.3. Do you think you can be an innovative teacher in the current educational system in Spain? Give reasons.

Figure 9.
Students´ answers about being an innovative teacher.



Students´ answers to question 3 coincide in percentage with answers in question 1. This result may be explained as students have had experiences in real life. They have experimented the difficulties that teachers face everyday with new technologies. Students answering 'no' justify their answers by telling their experience in the secondary school: answers such as 'teacher does not make use of new technologies as they do not feel like, or they do not know how to do it, or if they want to do it, but they find many institutional obstacles' are the most common answers when saying 'no'. Otherwise, students answering 'they would try with new technologies' may be the ones who, in their trainings, have met teachers willing to implement new language teaching methodologies and they work hard to make them use in the classrooms.

5. CONCLUSION

Our students enrolled in our Master Degree are young students, eager to start their professional careers. They all have the key to improve our educational system. They have to contribute to our society to make their future students become competitive and competent citizens. This is an individual task and they are willing to implement the theoretical background they have studied first in their degree and now, in the Master degree. However, when they face realia, they understand there is much work to do, as current classrooms in secondary schools are not as ideal as they thought. As far as they are concerned, they encounter some institutional, logistic and bureaucratic hurdles together with some secondary school teachers' obstacles such as lack of time, lack of knowledge or simply they do not feel like having extra work. In conclusion, the three main drawbacks when making use of new technologies are: investment of money, investment of time, uncertainty of results but with effort, hard work and institutional help, they can change the educational system.

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Chapter #10

THE IMPACT OF NEOLIBERALISM ON TVET IN ENGLAND

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ABSTRACT
Neoliberalism, as embraced by many employers in England, has had a number of impacts on Technical and Vocational Education and Training (TVET). Among others, it introduced performance measures to every aspect of the system, not just to learner achievement, thereby giving employers a dominant role in the TVET sector. This chapter focuses on the historic relationship of employers in England with the education and training sector and explains where the disproportionately strong role of neoliberal employers originated and how it persists to this day. It also explains how the problematic role of neoliberalism in the mind set of employers has contributed to the partial failure of government policy in TVET in that this education and training sector is being shaped in accordance with the demands of large employers, to the detriment of wider sector and of economic skills growth. The chapter also reflects on the barriers that neoliberalism erected to the creation of a TVET system which can truly address the needs of the economy as well as of individuals as total human beings. It concludes by suggesting ways in which some of these issues might be resolved, for example, through better partnerships with a wider group of stakeholders, such as universities, government and parents.

Keywords: neoliberalism, employers, TVET, education, training, social space and ethical action / function theory.

1. THE PROBLEMATIC ROLE OF EMPLOYERS IN THE TVET SECTOR IN ENGLAND

The employer relationship with TVET in England is problematic in that it has resulted in a system of technical and vocational education that appears to meet neither the needs of business and of the economy, on the one hand, nor of individuals as human beings on the other. This chapter critically explores possible reasons for this phenomenon, in the process drawing on historic, systemic and cultural factors. It also examines the impact of neoliberalism on the employer relationship with the TVET sector. It will be argued that the ability of the employer sector to formulate and execute a skills plan to support the economy has been hampered by its embracement of this ideology. The neoliberal approach, it will be contended, has put employers and employer organisations in a difficult if not an untenable position in that many of them understand that while pre- and in-service training of staff should serve the ideal of profit-making, the training of future and existing employees (also in the form of TVET training) as such is essentially a pedagogical undertaking that should be guided by pedagogical and not business or economic principles.

In countries where successful revolutions have recast society, government was able to establish a new culture through a central, national education system for all citizens. Historically, in England, however, where no such revolution took place, economic success has been linked to the interest of individual businesses rather than to that of the overall economy, the needs of society or of individuals as human beings. This explains why a

persistent historic feature of the TVET system in England has been the neglect by employers of the technical and vocational training of their workers. This employer attitude stems from having had access from the time of the industrial revolution to plentiful cheap labour to serve their business needs; training was not seen to contribute to the success of business and of the economy. At the same time, however, businessmen themselves aspired to the classical liberal education of the Upper Classes. Notwithstanding the historic existence of master craftsmen (Sennett, 2009), a prejudice against TVET took root, and persists to the present day. More recently, supplies of skilled, cheap(er) labour from outside the UK have compounded this problem in that they lend support to the view that a better national training system is unnecessary for business and economic success.

The resulting lack of investment by the majority of employers in high quality TVET, and the on-going view that academic education is superior to it, has never really been challenged by governments[1] (Andressen, 2016). This may be in part because no one seems to really know what the relationship between employer and the education and training sector should be. Employer obedience to the firmly established principles of individualism typical of the "classic" liberal economic ideology also remains a strong theme not only in the stance of employers but also in the development of TVET policy by education authorities. The liberal notion of free trade was, for instance, closely associated with belief in minimalist government intervention in the lives of citizens. Although neoliberalism later on tried to combine 'laissez faire' economic principles with greater state intervention in welfare and public goods, including education and training, this did not sit well with established cultural (i.e. classic liberal) practice and prejudice in England. The persistent impact of liberalism, also in its neoliberal guise, has resulted in a reliance on, and in the overly-significant impact of employers and business practice, such as performance measures, on education and training in England.

The inculcation of skills in the work force of employers is as much a matter of policy as it is a reality (Gleeson & Keep, 2004) required by government as a peg on which to hang a number of education and training initiatives. Employers themselves, however, are more concerned with the attitudes (89%) and aptitudes (66%) of school and college leavers than with the possession of specific occupational skills, except for the highest-skilled roles, where they predict a shortage of potential recruits with the required Science, Technology, Engineering and Maths (STEM) skills in particular (CBI, 2016).

The role of employers in the development of non-technical skills, and their ability to carry this task out effectively are the subject of much debate (DfES, 2002; Stanton, 2006; Payne, 2008). One of the issues here is that the same large business corporations are often over-represented when it comes to defining the skills required for occupations in the sector (Payne, 2008). Such skills are not always appropriate for similar roles in smaller organisations that remain more difficult to engage. There is also the fear among employers that the personnel that they have trained will be poached by other organisations. All these considerations may lead to training being limited and mean that the transferability of the training – and therefore the prospect of progression in the work place or employment elsewhere for the individual – may remain poor.

Examples of the uncertainty regarding the purpose of vocational training / education and what it should look like, and the related failure of policy to address this problem, include:

[1] UK education policy varies considerably between England, Scotland, Northern Ireland and Wales. The focus of this chapter is on policy in England, although the government is that of the UK.

- the creation of multiple versions of schools- and work-based vocational provision in an attempt to create parity of esteem between the vocational and academic tracks;
- the more recent assessment of vocational subjects through final examinations, rather than through the more traditional – and arguably more appropriate – project and coursework,
- the introduction of Modern Apprenticeships under New Labour,
- the replacement of Modern Apprenticeships by frameworks-based apprenticeships
- and most recently, a standards-based approach.

High quality technical-vocational training such as for Engineering and Construction does exist in pockets. However, the *government* has continued to supply largely unplanned vocational training for all industries, funded by the taxpayer, and has been using vocationally-based provision as a tool to keep young people deemed not capable of pursuing the academic track in full-time education. Reasons for this approach include a hope that young people who have not succeeded on an academic track might do so on a vocational one; a lack of entry-level roles for unskilled, 16-year-old school leavers in the modern economy, and more cynically, a desire for government to keep a large number of young people off the unemployment register. This multifarious purpose has done little to increase respect for this form of education and training.

Coupled with these country-specific issues, increasing globalisation has meant that businesses may be based anywhere in the world and employ an international personnel. Technology allows individuals to carry out work – and be paid for it – without ever entering or leaving a country. National governments no longer enjoy the previous level of control over economic activity, the resultant jobs nor over critical sources of revenue used for the provision of 'public goods' such as education, health care and welfare. Yet the assumption persists that international business will also support 'national interest' in the shape of a better performing UK education and training system (Keep, 2012) by training people not only to meet the skills needs of the individual business, but also of the wider economy. The government can only request inputs - or partly steer them by means of policy - rather than arrange and enforce employer contributions to education and training.

The *essential problem* that TVET in England has had to contend with is that historically employers have relied on a supply of cheap labour, and on the government to fund the training of any skills shortfall for business to achieve success. The role of employers in the formulation of skills policy has therefore remained voluntary to a large extent and, as outlined above, has occasionally exerted a disproportionately high impact on the TVET sector. The government's positioning of employers at the heart of the definition of TVET training provision has been aimed at giving legitimacy to the content and outcomes of the TVET sector: employers prefer to educate and employ workers who show academic promise and hence seem to show an indifference to TVET (Andressen, 2016). Employers seem to favour qualifications which for them represent the brightest, if not most skilled, potential recruits. A levels, for example, are considered to represent this high standard. This attitude on the part of government and employers has so far led to the sub-optimal unfolding of TVET in England.

The role arguably played by neoliberalism in the evolution of this problem will now be discussed in greater detail.

2. NEOLIBERALISM: GOVERNMENT AND GOVERNANCE IN THE UK

In the early 1970s, firms began to feel the impact of falling productivity, and many managers believed that the mounting power of organised labour (labour unions) was responsible for this. Neoliberalism's set of pro-market and anti-labour policies were first implemented by the United States backed Pinochet dictatorship in Chili (around 1973). The monetarist economic principles of the "Chicago Boys" guided the process from then on, and northern- and western-based financial institutions such as the World Bank and the International Monetary Fund began applying "shock therapy" (structural adjustment programmes) to ailing economies in different parts of the world (Marois & Pradello, 2015, p.2-3).

Neoliberalism has many variants; it constantly evolves and diversifies. Neoliberal ideas are rooted in the principles of "classic" liberal economic and political theory and are related to the rise of the first commercial-consumer society, the expansion of trade and commerce, the availability of commodities and profits for the metropolitan market, the rights of free men and women, the accumulation of wealth, the imperative of looking after one's own interests, and in the lexicon of "bourgeois" ideas such as freedom, equality, property, possessive individualism, self-interest, a limited form of state, free trade, capital growth and gain. Neoliberalism has not only "revived" all these ideas but has gone further in that it now imposes many of these business and economic principles and ideas on non-business and non-economic activities such as education and training (TVET). It has given to each of these classic liberal ideas a "market inflexion" to make them applicable to a modern, global, post-industrial capitalism (Hall, 2011,:p. 12-16).

The discussion above and below provides evidence of how employers and other stakeholders such as governments have of late been vacillating between two sets of principles: the demands and imperatives of business and the economy on the one hand, and the insistence on application of pedagogical principles such as the guiding, equipping, unfolding, shaping, forming and nurturing of young people on the other (Nussbaum, 2011, p. 23).

In the past four or five decades, the on-going voluntarist nature of the employer role in England, which has seen employers "invited" or "allowed" to play a central part in the funding and delivery of TVET, with no consequences if they chose not to, coupled with changing global and national influences on policy and the gradual neoliberal "colonisation" of educationists' minds and approaches, inspired the state to change its relationship with business. Successive governments, from Tony Blair's New Labour, to the Conservative-Liberal Democrat Coalition, and Cameron's Conservatives, have responded to neoliberalism in ways that sometimes seem at odds with their political positions.

Tony Blair's 'New Labour' government was, for instance, forced to carve out a new relationship with employers in response to the dominance of business influence on the economy. It marketised the state, allowing private sector practices and capital to permeate all levels of government. It looked for efficiency gains in public services, contracting them out to - or treating them as - private companies, and setting up new forms of governance to manage their activities. This led to a proliferation of small organisations, accountable to government departments using neoliberal practices such as 'new managerialism' more commonly associated with the private sector, for example assessment against pre-defined outcomes, league tables and employer engagement targets (Clarke & Newman, 1997; Stewart, 1998; Newman, 2001; Jessop, 2002; Payne, 2008).

Qualifications and changes to the delivery infrastructure also have been critical to the ambitions of successive UK governments. The 14-19 Diplomas created under Blair's New Labour, for example, were an attempt to offer a high-quality vocational alternative to academic provision in full-time education. The introduction of university tuition fees by the Conservative-led Coalition (2010-2015) was seen as a way to reduce the number of young people pursuing degree courses considered to be of little value in the jobs market, and to reduce public spending. This approach has forced many students into a debt trap as a result of the fact that higher education was turned "into a precious commodity to which individuals aspire and gain access" (Naidoo, 2009, p. 163). The rise in undergraduate numbers in courses that were regarded to be worthwhile actively driven by New Labour policy is considered a contributing factor to the decline in technical skills since those who might have pursued short, technical courses, instead pursued degree courses of questionable worth.

The nature of job opportunities concomitantly changed and their number decreased (UKCES, 2011). Not only have the poorly skilled found it difficult to secure employment; even graduates struggle to find employment normally associated with degree-level qualifications (Resnick, 1987). Under-employment and temporary contracts became common, resulting in the fact that social gains associated with a graduate job such as the ability to buy or even rent a home have become increasingly limited. Efficiency and an ethic of cost-benefit analysis have become the dominant norms in the process, thereby creating a closer linkage between education and the economy (Adams, 2006, p. 3 ff).

In her comprehensive review of vocational education on behalf of the British government, Wolf (2011) sought to reposition education in England as being for the good of the individual as well for as the economy, declaring that no learner should be steered onto a course – academic or vocational – that is a "dead-end" (8). It is clear from the above that tension has grown between the role of the state and the role of the employer in ensuring a skilled workforce, both for the good of individual businesses, the national economy, and the welfare and social and economic productivity of the individual. The neoliberal narrative of empowerment through individual choice masks a shift towards individual rather than state responsibility for social problems through the "logics of the market, responsibilisation and self-esteem" (Wright, 2012, p. 280). There are limited opportunities for "participation in dialogue and social integration" under neoliberalism; society divides and becomes more self-interested (Bates, 2012). Marketisation requires social policy, not only to combat the negative effects of markets but also to support the market with things it cannot provide for itself. Marketisation and social policy, however, are usually seen as opposing projects (Crouch, 2014).

The media in the UK and the United States have begun heralding the death throes of neoliberalism (Jaques, 2016; Mishra, 2017), and there are signs that both politicians and citizens in the West are waking up to the reality that neoliberalism has benefited a very limited number of people, with fewer education and career opportunities a key indicator of this (cf. Huntington, 2005). Neoliberalism however is obviously not the only explanation for the limitation of job opportunities. Technology, for example, has helped cause a hollowing out both of manufacturing jobs and of the middle management level in white collar organisations. For purposes of this discussion, however, it is worth noting that the negative effects of neoliberalism seem to have filtered into the consciousness of those who have previously benefited from, and defended it. Unfortunately, the structural and cultural changes needed to create responsive skills provision in England seem to be as distant as ever.

3. A CRITICAL ASSESSMENT OF THE SITUATION

The discussion of issues raised here is necessarily limited in its scope and nature by the length of the chapter. A great deal has been written about the role of employers in (T)VET, with a wide range of factors being blamed for its problematic characteristics, among others the disproportionate degree of power exerted by employers on education (T)VET and the place of education within society, namely mainly for economic support and not for the development of the individual as a total human being (Gleeson & Keep, 2004; Wolf, 2011). The desire to create a social partnership in which the rights, responsibilities and duties of all involved in the development and delivery of (T)VET (including employers) has become more clearly articulated (Hodgson & Spours, 2003, p. 58).

Competition and privatisation in a neoliberal spirit have produced educational, social, and economic inequalities (Pantazis & Gordon, 2000; Ball, 2003; Tomlinson, 2005), and have confronted employers with a potentially confusing and conflicting set of demands and potential roles in policy (Hodgson and Spours, 2008; Huddleston & Laczik, 2012). In England, where regulation has been weak, and historic attitudes to (T)VET remain damaging to its success, some employers have benefitted considerably from access to government funding or government-trained labour resources. They have also had access to, and influence over, non-education policy through their "engagement", however informally, with successive (T)VET policy initiatives, resulting in positive publicity for their efforts. In a fully-regulated system, however, employer provision of apprenticeship places and technical training would have been expected of them.

The role granted to employers has been based on two key assumptions. The first is that they are better placed and more able than other stakeholders to articulate teachable, assessable learning programmes to meet future employment needs, and that they would want and value new vocational qualifications (Tomlinson, 2004). The second is that there exists a single "employer view" of what learning provision is needed in both compulsory and post-compulsory education to enable progression to employment.

Gleeson and Keep (2004) question the assumption of treating employers as a heterogeneous category, showing how differences in business size, location and management style can shape employer inputs. Individual representatives of an organisation or sector might furthermore differ in their opinion of what that particular industry, sector, occupation, business type or location requires from the (T)VET system. Hodgson and Spours (2008) are in turn convinced that while employers seem to have been privileged in policy they remained powerless in practice. According to Gleeson and Keep (2004), "largely un-fettered de-regulation" has gifted employers a" voice without accountability" (p. 37).

In her 2016 research into the problematic role of employers in (T)VET in England, Andressen argues that despite the importance of structures, institutions and processes (Jensen, 1994; Lumby & Morrison, 2006), a system which is not fully regulated must rely on individual behaviours and initiatives for success. Individual attitudes towards, and perceptions of, vocational education and training can be disappointing, however. Employers who for instance refer to potential candidates for TVET as "thick", "dumb" and "stupid" will struggle to create a truly valued set of education and training provision. Many of the employers today contributing to the formulation and implementation of skills policy are themselves products of the English system as described above, and hence to a certain extent conditioned to the belief that vocational education is inferior to the academic route. As a result of this conditioning, they tend to shape employee recruitment and training policies accordingly. Their understanding of the education and training sector and their

ability to make decisions as members of advisory groups are further impacted upon by their position within their employing organisation, their knowledge of vocational occupations when they are in management positions, and their consequent (in)ability to commit resources to the education and training effort. Acknowledgement of all these assumptions, behaviours, barriers and drivers is a critical first step in changing the currently hidden dynamic in policy implementation, as outlined above (Andressen, 2016).

Barriers to defining an effective role for employers regarding TVET include over-emphasis of the importance of skills to employers; the lack of a national industrial policy; a "learned reliance" (Andressen, 2016: 58) on the education system to provide any training needed; public funding, plus (before Brexit) a ready supply of skilled workers from the single EU market, trained at limited or no cost to UK-based employers. There is also the continued lack of a licence to practise, that is, official, compulsory recognition, similar in concept to the driving licence, which is required before an individual can work in a given sector. Also the absence of employer roles in relation to education and training as well as a disjointed employer view of skills in the UK, which differs from the broad vision of a skilled and roundly educated individual held by European apprenticeships. Employers in England often concentrate on fulfilling their immediate skills needs. Another barrier is the push for "flexibility" in programmes as a way to minimise what is required of the employer. In short, the employer in England appears to hold all the cards in the training arena. This claim can be substantiated as follows.

The Post-16 Skills Plan (DBIS, DfE, 2016) positions employers at the heart of the government vision for TVET. The Plan makes them responsible for creating standards, for deciding on assessment strategies, for defining the content of apprenticeships, in some cases without any other stakeholder input. Whilst there is a central supervising body, the Institute for Apprenticeships, to manage standards, it is difficult to hold it to account, or enforce or update standards created by temporary employer groups.

The introduction of a levy[2] – 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 money available to the treasury to upskill the workforce. The downside of this is that pressure on employers to use their contribution to the funding levy appears to have driven negative behaviours such as the use of standards based on the amount of funding available for a given occupational route, the upskilling of the existing workforce rather than the creation of new positions, and in some cases, a total absence of education and training provision.

The lack of nationally recognised qualifications concomitant to the standards furthermore may result in variations of quality and acceptance. This may lead employers to overlook some qualified individuals in favour of those trained by nationally or regionally known employers, or holding qualifications more familiar to the employer. Whilst the change in sectors which have kept existing qualifications and proxies as part of their standards may be minimal, in others, employers have set out their preferred approach, regardless of practical considerations. Such contingent composition of standards might lead to a situation, for instance in the Logistics Sector, where no proxy qualifications are included, and a driver holding a full British driving licence might be assessed as a non-competent driver in a final assessment.

[2] https://www.gov.uk/government/publications/apprenticeship-levy-how-it-will-work/apprenticeship-levy-how-it-will-work#pay-apprenticeship-levy

4. A POSSIBLE WAY OUT OF THE QUANDARY

It is clear from the discussion above that the provision of TVET in England has been suffering from a lack of understanding, cooperation and alignment between employers, government and the education and training sector. This has resulted, among others, in the employers becoming complacent with a particular set of circumstances, for instance the over-abundance of cheap labour, or being driven on the defence by an over-involved government. The problem seems to lie in a weak understanding of what the relationship between the employers, government and the education and training sector ideally should be. One way of solving this problem is to learn the hard way, through trial and error, by thrashing out an understanding between these three sectors based on experience and conflict. We would suggest a more principle-based route, however. The critical pedagogical approach that we have been following so far in this chapter allows us to also employ a transformative strategy (Ungerer, 2014, p. 4; De Lange, Moletsane & Mitchell, 2015, p. 152, 169, 172), as will now be briefly attempted in terms of the *social space and ethical function / action theory.*

Van der Walt (2017, footnote 5) recently summarised the *social space and ethical function / action theory* as follows. The theory firstly suggests that individuals, groups and societal relationships such as families, the state, business, school, universities, the education and training sector 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 aspect is only one of the modalities of reality, and it is interwoven with all the others. The theory secondly suggests that each individual, group or societal relationship has been entrusted with a unique mandate, function, aim, purpose and calling within its own unique social space. Each should pursue its function and purpose with due diligence, responsibility and accountability and with due respect for the social spaces, self-determination and functions of all other individuals, groups and societal relationships. This respect entails recognition of the twin principles of sphere sovereignty and sphere universality. The theory thirdly suggests 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, caring for the person and interests of the other, Kant's categorical imperative or Rousseau's maxim of doing unto others as you would have them do unto you. Respect for this third principle will afford social space for all individuals, groups and societal relationships to manifest and express their own meaning in life and hence contribute value in and for humankind.

What this theory suggests in the context of this chapter is that the TVET programme in a country such as England should be conceived and developed in the special social space provided by the intersection of the interests of all the stakeholders involved. It is important to firstly recognise that TVET is a form of *education*, and that as such it occupies a special social space where *only pedagogical and didactical principles and norms* apply, and not for instance business or state principles as such, although these also tangentially or secondarily come into play in the TVET sector. Although TVET occupies this special (sovereign) space as a pedagogical-didactical undertaking, the interests of many other social spaces influence and affect its conception and evolvement. Government has an interest in TVET since the welfare of the state depends on the welfare of this education sector, among others. Since other stakeholders often are not in a position to concertedly determine the shape of TVET, for instance as far as the financing of the sector is concerned, governments have in the past usurped their stakeholder position and regarded themselves as the main providers of TVET

and hence insisted on dominating the scene as far as TVET is concerned. This approach, we would argue, is not defensible in terms of the social space and ethical function theory. Government is only one of the stakeholders in TVET along with the employers, the student body, the students' parents and other parties, and it should recognise this restriction on its role. Understanding of the principles of sphere sovereignty and of sphere universality will help government and all the other stakeholders to eke out a principled place in the joint venture that has become known as the TVET sector. Sphere sovereignty entails understanding that each role player has a special stake in TVET, and sphere universality suggests that they should all work together to make a success of this special sector as a pedagogical-didactical undertaking. Application of these principles will also prevent employers from playing a dominant neoliberal role in the education and training sector.

The ethical aspect brought to the discussion by the *social space and ethical function / action theory* dovetails with what has been said above. Each of the stakeholders in TVET should recognize and respect the ethical principle of diligent care of and for the interests of all other individuals, groups and societal relationships involved in the TVET sector. This is important in the current situation where neoliberal principles are being indiscriminately applied to sectors where they in principle do not belong. Neoliberal principles might be acceptable in the domain of business and economics, but not in the domains of either the state (government) or education, including the TVET sector. Government should therefore be wary of promoting neoliberal principles in spheres where they do not in principle belong, including TVET. A government that does not understand this tends to indiscriminately apply such principles also to those education sectors in which they historically have acquired an inordinately strong say and influence, as has been illustrated above. This should be avoided, and where it has already taken effect, should be actively countered. The same applies for the role of the employer sector.

5. CONCLUSION

It has been argued in this chapter that TVET in England has developed in undesirable directions, among others as a result of misconceptions among employers of their roles in this education and training sector, also as a result of a certain amount of complacency among stakeholders such as employers, and / or as a result of successive governments playing an inordinately dominant role, a passive or reactive role in the sector. It has furthermore been argued that, due to a lack of understanding of their roles as stakeholders in the TVET sector, both the employer sector and government have allowed non-pedagogical and non-didactical principles such as those flowing from a neoliberal approach to life and business to affect the TVET sector. It is suggested that all stakeholders in the TVET sector, though mainly government and employers, acquaint themselves with the principles involved in understanding their respective stakeholder roles in this joint venture. This could lead to a fundamental transformation of the TVET sector in England and elsewhere.

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Chapter #11

ANALYZING VALUES EDUCATION IN SCHOOLS IN GERMANY
Theoretical Model and Empirical Data

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ABSTRACT
The main objective of this contribution is to introduce a model for analyzing values education in institutions, and to illustrate this model by providing data on projects fostering values education in schools in Germany. Our model includes five levels, namely (1) needs/objectives of practical values education, (2) the macro-level (politics and society), (3) the meso-level of institutions, (4) the micro-level of interactions between individuals, (5) and the outcomes of practical values education. The presented model is exemplified by projects that were launched in schools in Germany in the years 2009 to 2014. We identified 51 school projects that were analyzed according to our model. Results show that using this model for analyzing values education is an effective way to obtain a systematic overview about different projects for values education. Even though needs/objectives, meso-level and micro-level are reported in these projects, often, key issues for explicitly evaluating the outcomes of the projects on values education are missing.

Keywords: model of analyses, values education, values competence, values-based behavior, institutions, schools.

1. INTRODUCTION

Values education is one main topic in all countries around the world. Globalization, digitalization, and global warming are world-wide developments which make the sensitization for values more prominent in society. Thus, not only families, but society and politics have to focus on this topic.

When looking at society and politics, it is interesting how values education is realized in different institutions, primarily in schools. In the UNICEF Kids Values Monitor, results indicate that teachers are evaluated as the third most important factor for transmitting values to students (UNICEF, 2014). Thus, schools are of main importance for values education.

Values education in schools can be fostered in two ways: First, implicitly by the school climate or by teachers who act as role models for the students and second, explicitly by e. g. initializing projects. As school is an institution in which students come together and interact with each other for long periods of time, projects initiated in schools with the objective to foster values education can be an effective method (Schubarth, 2016).

To compare projects according to relevant issues for values education, a model for analyzing such projects is necessary. But even though schools are of primary importance for values education, there exists no explicit model for analyzing such projects in a coherent way. Therefore, we want to introduce such a model for analysis in order to compare the practice of values education specifically in schools and to exemplify it with relevant project data.

2. BACKGROUND

"Values are a fundament of any social community" (Menzel, 2013, p. 125). Thus, values are of importance in any culture and any society around the world: "Values are (a) concepts or beliefs, (b) about desirable end states or behaviors, (c) that transcend specific situations, (d) guide selection or evaluation of behavior and events, and (e) are ordered by relative importance" (Schwartz & Bilsky, 1987, p. 551). That means that values are guiding principles for the individual to evaluate things, persons, behaviors or events in their environment.

Values education is the process of acquiring or changing values throughout the lifespan. By actively engaging with the environment and its diverse and conflicting values, values education takes place. This can happen implicitly, e.g. through role models or observation of diverse situations, etc., or explicitly through specific methods for triggering reflection about values.

Values education is not only a primary aim of education, but it also makes a peaceful living together possible. Thus, "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" (Kopp, Wallner, & Mandl, 2017, p. 567).

Looking at different countries, values education is realized in diverse ways. While in countries like the United States or Great Britain character education is explicitly part of the curriculum in schools, in Germany this is only partly realized by the curriculum (Mandl, Kopp, Hense, & Niedermeier, 2014). Thus, using specific programs or projects is not as crucial in these countries as it is in Germany. One main possibility for fostering values education is the initiation of projects.

To compare projects according to relevant issues for values education, a model for analyzing such projects is necessary. Currently, there is no specific model for analyzing values education in a coherent way that enables researchers to obtain a picture about relevant categories for values education and to compare such categories according to these criteria.

Therefore, we wanted to generate a model for analyzing values education. In order to do this, we had a closer look on two issues: First, we looked at socialization processes and models, because values education is part of the socialization process of each individual (Lapsley & Stey, 2014). Second, we focused on relevant issues that are relevant for the project practice, namely the input-process-output (IPO) model (Bushnell, 1990). We identified three relevant categories from socialization models, namely the macro-level, the meso-level, and the micro-level (Blackstone, 2015), and two categories from the IPO model, namely needs/objectives and outcomes of practical values education (Bushnell, 1990). Thus, our model for analyzing values education in schools comprised five categories: Needs/objectives of values education, macro-level, meso-level, micro-level, and outcomes (see figure 1).

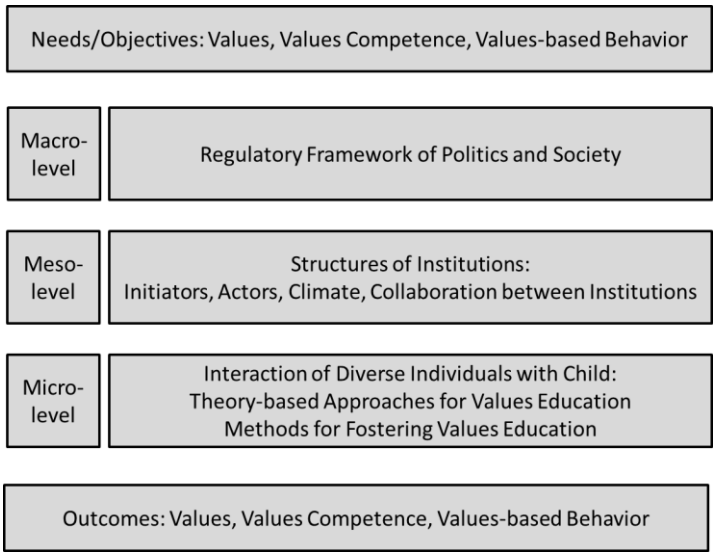
2.1. Needs/objectives of values education

Each project needs objectives for initiating a starting point. These objectives focus on the specific needs of different agents of socialization like family, day-care center, schools or youth employment. In such a needs analysis the need and demand of the receivers are determined (Otten, 2013). Thus, the target group must be taken into account, which means that projects that are launched for young children from 6 to 10 years of age may be different than projects for teenagers between 11 and 15 years.

Furthermore, exactly capturing the problems in values education and defining concrete and realistic aims to overcome these difficulties are of importance at this first level. Such aims could be differentiated into three categories: (1) values content, (2) values competence, and (3) values-based behavior.

Values content includes diverse values that are relevant in a democratic society. Values competence comprises the ability to deal with values-based attitudes, values conflicts and the significance of values in decisions. Values-based behavior means the transfer of values into actions. Overall, sensitizing students for values in order to foster values competence and values-based action is more important than teaching them a canon of values that are not transferred to the individuals' behavior.

Figure 1.
Model for analyzing values education in institutions.



2.2. Macro-Level of values education: regulatory framework of politics and society

On the macro-level, we find the regulatory framework of politics and society. That means that in different political and cultural systems, diverse frameworks are adapted to values education. Even though the macro-level is not often picked out as a central theme, there are significant differences between political and cultural systems all around the world, specifically between Western and Eastern countries (Fung, 2006; Trommsdorff, 1996). Such differences comprise among other things a more individual orientation in Western countries compared to a more collaborative orientation in Eastern countries (Hofstede, 2001). Thus, it is necessary to take the macro-level into account when looking at values education – even though it is mostly given by laws and normative rules in each country.

2.3. Meso-Level: structures of institutions

Regarding the meso-level, there are specifically the structures of institutions of relevance that include, among other things, the division of tasks and responsibilities, the hierarchy between individuals, the organization of specific procedures, and the establishing of rules. Four main aspects are relevant with respect to structures of institutions that foster values education: (1) the initiators, (2) the actors, (3) the climate of the institutions, and (4) the collaboration between diverse societal levels for socialization.

Initiators are the ones who launch projects in order to foster values education. According to the initiators' values, specific methods for fostering values education are introduced in the respective institution.

Actors are the ones who implement and execute values education using a specific method. In this respect, the qualification of the actors is of main importance regarding their own reflection on values, their values-based behavior and their professionalism in order to act as role-model for children or youth (Erbes, 2012).

Regarding the values-based climate, values are directly experienced through social cooperation. Mutual appreciation, perceived trust, reciprocal acceptance, democracy, respect towards diversity and justice are part of such a climate (Erbes, 2012). Thus, values must be incorporated into daily living together and not only formulated as theoretical constructs. It is also necessary that values-based principles are essential in the conception and implementation of projects, in the contact with the learners, in the team, in the reflection, decision-making, or solving of conflicts.

Collaboration between single institutions is also part of the meso-level. Specifically, collaboration between school and families are of great importance. Sometimes, school children learn that leisure time activities are valued as less important than school. This may have a negative effect on the values education of children (Scherr, 2002). Given that school captures a big space in children's lives, it is of immense importance that schools collaborate in a values-based manner with families.

2.4. Micro-Level: Interaction with the child – theory-based approaches and methods

The micro-level comprises the interaction of adults or peers with the child. The first experience of the child with values is in the interaction with parents, sisters or brothers. Appreciation is one main antecedent for values education that should be the tenor in any interaction with the child. This interaction is not unidirectional regarding parents or teachers influencing children. Rather, it is bi-directional in a way that children also have an effect on the interaction process (Trommsdorff, 2008).

Three aspects are of relevance in this context (Trommsdorff, 1999, p. 174): (1) Who educates children and which values, aims, expectations, and competences do they have? (2) How is the quality of interactions and relationships of the interacting individuals? (3) In which cultural and institutional context does education take place?

There are a lot of theory-based approaches that are relevant in the interactions regarding values education. Such theoretical approaches on which values education are based are e.g. the parenting style showing that an authoritative parenting style is positively related to acceptance and acquisition of values, to prosocial and responsible behavior as well as to personal autonomy (Stein, 2013). Another important theory-based approach is the social learning theory of Bandura (1977). This theory explains that children learn through observation and imitation of specific behaviors in interacting with other individuals (Lokhande, 2011). One key aspect contains the motivation of children to show a specific

behavior. Role models with emotional proximity to the children provide an important function in values education.

Furthermore, several methods for fostering values education are developed. One primary method, which is the focus of this contribution, is the initiation of projects. Projects are unique initiatives with specific aims, personal, financial and time restrictions. Project work focuses on activity-oriented learning, personal experiences and joint communicative reflection of group processes (Frey, 2002). Values-based projects should not be short-time initiatives, but implemented in a sustainable way. In this respect, projects are adequate methods for values education.

2.5. Outcomes of values education in practice

Outcomes of values education in practice are relevant in order to show how far the respective intervention was effective and helpful for the target group with regards to values content, values competence, and values-based behavior. Regarding values content, single values as well as knowledge or the sensitization about such values are relevant aspects. Values competence includes the ability to discuss diverse values and find a solution in e. g. dilemma situations. Looking at values-based behavior, the transfer of values education into action is of interest (Lickona, 1991) including behaviors like sharing, donating to charity, or telling the truth as well as the tendency to act with honesty, responsibility, or altruism (Berkowitz, 2011).

According to the formulated needs and objectives of the respective initiative, outcomes of values education as mentioned above should be evaluated. There are diverse evaluation methods like asking the learners with interviews or questionnaires about the values they have acquired, observing discussions of the learners or adequate situations in which they have to behave in a values-based manner. Such outcomes give an indication of the effectiveness of the respective initiative in order to foster values education.

3. DESIGN

Our research is based on the introduced model for analyzing values education in schools. We designed a cross-sectional study that examined results of all projects that were launched in Germany in the socialization levels for schools in the five years between 2009 and 2014. All projects had to be documented in order to identify relevant criteria for analyzing values education in projects which were launched in schools. Overall, we identified 51 projects that were introduced in schools in the years 2009 to 2014 in order to foster values education for students.

4. OBJECTIVES OF THE STUDY

The main objective of the study was twofold: Firstly, we wanted to develop a model for analyzing values education in institutions as we did above. In a second step, we tried to exemplify this model with data from projects designed to foster values education in schools in Germany. Therefore, our main research question is: *Does the model for analyzing values education in schools in Germany fit to the actual project data?*

5. METHODS

5.1. Data sources

To identify practical values-education in projects, we looked at (1) current literature (e.g. empirical studies or evaluations), (2) political documents (e.g. laws), (3) internet research (e.g. Google scholar) and (4) databases (e.g. www.phineo.org, www.demokratisch-handeln.de, www.land-der-ideen.de, or www.bildungsserver.de).

We only had access to data that was documented in a written format. Thus, smaller projects that may not be recorded officially via the above mentioned data sources were not included in this study.

5.2. Data analyses

Based on our theoretical model, all information was inductively analyzed according to the following coding scheme: "needs/objectives", "macro-level", "meso-level", "micro-level", and "outcomes". The macro-level included the regulatory framework of politics and society. The meso-level was subdivided into four categories (1) initiators, (2) actors within each single societal level for socialization, (3) the climate of the respective institution, and (4) the collaboration between institutions. The micro-level comprises the interaction of individuals. According to our theoretical model, we referred to (1) theory-based approaches that were implemented to foster values education as well as to (2) specific methods that were used to foster values education. Even though, our research focused on project-based approaches in values education, data of the investigated projects showed a more specified picture regarding the used methods.

We coded the documented information for each project according to the developed coding scheme which comprises the elements of the theoretical model. Every study was included in multiple categories. Furthermore, multiple answers per criterion were possible in every project. We counted all similar answers descriptively to one score. Ten per cent of the codes were double-rated by a second rater.

6. RESULTS

To determine, whether the introduced model is adequate for analyzing projects on values education in Germany, we took a closer look to the five main categories of the model: needs/objectives, macro-level, meso-level, micro-level, and outcomes. Overall, we found 51 projects in the socialization level of schools that launched projects for values education in the years 2009 to 2014.

Regarding the **needs/objectives**, we found 22 different objectives mentioned in the analyzed projects (see table 1). The results show a much diversified amount of needs/objectives in the different institutions.

Table 1.
Needs/objectives of the analyzed projects.

Numbers	Needs/Objectives
12	Cohesion
6	Democratic Behavior
4	Transmission of Values, Moral Education, Values Argumentation, Integration into Work
3	Participation, Conflict Resolution, Responsibility/Responsible Behavior
2	Commitment, Integration, Values against Right-wing Extremism
1	Reflection, Social Competence, Positive School Climate, Solidarity, Sustainable Thinking and Action, Inclusion, Positive Personality Development, Positive Learning Culture, Autonomy, Innovative Methods of Teaching and Learning

On the **macro-level** we find the German Basic Law, the constitution of every federal state in Germany, and the school laws of each individual school. The main issue in all these documents is the educational mandate to educate students to become an integral personality including values education and the attitude towards values. Values which are mentioned most often in this context are democracy, liberty, respect, and responsibility. Thus, all federal states in Germany formulate very similar values in their law.

The **meso-level** includes the structures within each societal level for socialization with (1) initiators, (2) actors, (3) climate, (4) and collaboration between diverse societal levels for socialization. In our analyses, we found specifically data for initiators and actors. Initiators who launched projects on values education are the following eight diverse institutions: (1) private actors (12 times), (2) associations (10 times), (3) public actors (7 times), (4) foundations (5 times), (5) schools (5 times), (6) churches (4 times), (7) 1 non-profit organization, (8) and 1 non-governmental association.

Actors who planned and realized projects were 12 different persons including (1) teachers who took the most important part (22 times), followed by (2) pedagogical specialists (15 times), (3) educators (12 times), (4) youth leaders (12 times), (5) mentors (5 times) and (6) students (3 times). All other actors were mentioned only once like (7) researchers, (8) parents, (9) students, (10) coach, (11) multiplier, and (12) paramedics. These results indicate that in the projects very specific actors were asked to execute the projects.

On the **micro-level** there are theory-based approaches for values education as well as methods to foster values education. Even though, we gather that interaction is implicitly based on such theory-based approaches, explicitly, there were no such approaches mentioned in the projects.

Regarding methods, overall 34 different methods were reported. Most often projects were mentioned (19 times), which is clear as this was the selection criterion. But besides this general approach, in some reports, more specified methods were indicated like mentoring (8 times), role model (7 times), values discussion (6 times), role plays (6 times), theater (5 times), training (4 times), and experience learning (4 times). Three times discussions were mentioned, coaching, seminars, students' participation, and awards. Thus, regarding realized methods for fostering values education, the investigated projects are very diverse and variable.

Looking at the **outcomes** of the projects, overall some successful issues are mentioned in the documents, but there are no evaluation data that could confirm these effects for the respective target group. Thus, implicitly some outcomes are achieved, which could not be explicitly confirmed by evaluation data.

7. CONCLUSION/DISCUSSION

Our research question regarding the fit between our model for analyzing values education and the reported data could be answered predominantly positive. We were able to analyze the needs/objectives, the macro-level, and in part the meso-level and micro-level in the model based on values education projects completed in Germany between 2009 and 2014. Categories that could not be explicitly investigated were on the meso-level involving the climate and collaboration between socialization institutions. Furthermore, on the micro-level we found no explicitly mentioned theory-based approaches on which values education were based. Even though, data did not indicate such approaches, we are convinced that some of them were used.

Furthermore, outcomes that are key issues for evaluating the effectiveness of the projects on values education are not explicitly reported based on evaluation data. Even though projects use diversified methods and different actors to conduct the projects in order to achieve sustainable results, these are not reported in the documents using evaluation data asking the target group about the effectiveness of the projects for their values education. Therefore, in reporting projects on values education, evaluation is necessary to focus more on the outcome of the respective projects on values education in Germany.

Even though, data on these levels was in parts limited, overall, this model seems to be a starting point to analyze projects on values education in a more detailed and systematic way. This makes it possible (1) to analyze the data and (2) to compare different projects with each other based on such objective criteria.

With this study, a first step in the direction towards a theoretically based model for systematically analyzing values education was made. But for sure, this model must be further examined with different data of other countries around the world. This would make it possible to compare values education in educational settings around the world.

Another limitation includes data analysis which was only based on written documents which were officially accessible. More different data like interviews or questionnaires with students or participants of the projects would be helpful to get more insights into used approaches or outcomes of the projects.

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ACKNOWLEDGEMENTS

We thank all researchers who participated in the development of this theoretical model and in gathering the empirical data.

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Chapter #12

HOW TO USE ROBOTICS IN EDUCATION

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ABSTRACT
This article describes a method for structuring and developing training programs based on educational robotics. The method can be applied in short-term programs, such as workshops, as well as in longer-term courses. We also present a mini-course structured according to the method, proposed and applied in form of a workshop to students and teachers of public secondary schools. The use of educational robotics to stimulate student learning in public schools is a reality in several developed countries of the world. In the Brazilian context, the main motivation underlying this project is the shortage of laboratories and materials for the development of experimental activities, observed in public schools. Thus, the development of the course allows not only students, but also their teachers, a contact with technological innovations, in particular in the field of educational robotics. The developed mini-course covers the topics and concepts of electronics and programming based on the Arduino platform, aiming to present the main resources available in this platform to propose and develop robotic-based educational activities. The course presupposes an active attitude of the students, who are instigated to "get hands dirty", which also contributes to their formation, through the development of new skills and abilities.

Keywords: educational robotics, arduino, robotics platform.

1. INTRODUCTION

Changing educational methodologies designed to cope up with the industries' human resources demands for new skills and competencies is an ongoing challenge. Accentuated in the late 20th century (D'Aveni, 1994) and in the 21st 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 do not apply these new methodologies in an efficient way, due to un-readiness 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 materials 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 adopted in this approach, as it broadens the range of activities that educators can exploit, as well as the possibility of integrating project management tools in higher education scopes (Oliveira, Oliveira, & Carvalho, 2016).

As Vasques points out, Educational Robotics can be considered an essentially interdisciplinary area (Vasques, 2010). Therefore, in this educational environment constituted by robotic devices, there is a constant dialogue of several disciplines such as mathematics, physics, computation, electronics, mechanics, among others. When students program a robot, they must develop/compose an algorithm to solve the problem in a logical mode and also need knowledge of physics to understand how the sensors operate.

According to Santos and Menezes (2005), educational robotics can be defined as the pedagogical context in which the student uses computers, electromechanical components (motors, gears, sensors, wheels, etc.), electronics (hardware interface) and programming, so that a given action can be performed.

For Sena dos Anjos (2008), Giordan (2006) and Miranda Junior (2005), educational robotics can offer important contributions to the teaching of science, especially for physics teaching. This is because it can offer important applications of fundamental physics concepts, as well as enable the development of procedural skills and competences.

In addition, it can be affirmed that educational robotics can motivate the student to learn concepts in view of the playfulness of knowing how to make something work. In this sense Vargas, .Menezes, Massaro, & Gonçalves. (2012) show that, unlike traditional teaching methods, this new pedagogical strategy has a significant impact on teaching and learning process because it arouses curiosity and elicits students' greater interest in the proposed activities. Thus, in each proposed activity, the student is challenged to find creative solutions, mobilizing knowledge, skills and competences. In this perspective, they are encouraged to formulate and test hypotheses, discuss new possibilities and interact more broadly with their peers.

Currently, different possibilities of application of robotics projects are offered for teaching science, among them Lego Mindstorms NXT and Arduino board, a platform of electronic prototyping of free hardware based on a circuit with inputs and outputs of digital and/or analog signal (Schivani & Pietrocola, 2012).

The low cost of the Arduino boards has made this platform an appropriate resource for different didactic applications. However, the teacher is not always technically and/or methodologically prepared to use this innovation in his classes. In addition, it should be noted that, given the limitations of time and the large amount of scientific content to be addressed in the high school physics and mathematics classes, teachers feel unmotivated to implement the use of educational robotics in their classes, as this would involve more content to be worked on.

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, the vast majority of students up to secondary education are unable to maintain an interest in STEM fields, thus compromising R&D capacity of the national industry. While there is much room for improvement with regards to teaching strategies and how to motivate students, there is an aspiration towards better education by providing better equipment and teaching materials for middle and higher schools, even when considering disadvantaged regions and socioeconomic classes.

In this context, this article describes a method for structuring and developing a mini-course based on educational robotics, aimed mainly at students of public secondary schools located in region of the Campus of UNESP Guaratinguetá, Brazil. The main motivation underlying this project is the lack of laboratories and materials, as well as the lack of preparation of teachers for the development of experimental projects and activities, observed in Brazilian public schools. Thus, the development of the course, in the university itself or in the schools, allows not only for students but also to their teachers, a contact with

technological innovations, in particular in the field of educational robotics. Among other aspects, the course presupposes an active attitude of the students, who are instigated to "get hands dirty" during all its accomplishment, which also contributes to their formation, through the development of new skills and abilities.

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, semester or yearlong 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 in STEM fields.

This paper is divided into four sections. The first section describes the robotics course proposal, presenting the main phases and core values of this course. In the second section a methodology for a robotics course application is proposed. The third section presents and discusses the results of the application of the robotics workshop within the activities planned for a Science Fair held at UNESP. This section also presents results of the application of the robotics course for a public high school, which is under the jurisdiction of the Teaching Board of the Guaratinguetá region in Brazil. And finally, in the fourth section, some conclusions of the work are presented.

2. COURSE STRUCTURE AND CORE VALUES

The primary 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 experiences of the students, and elaborate flexible and diverse applications for the studied topics. By doing so, not only can the educator better apply the methodology through the adjustments during application, 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.

Considering this, the course is divided into three main phases: theoretical learning, practical learning and project development. 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 platforms (Arduíno, 2017), 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 board.

In theoretical learning, students 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 regarding how electrical circuits work, while stressing the core concepts repeatedly throughout all 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 apply understandings from theory by building the circuits and programs. The educator can use the first part of the class to reinforce core concepts and provide examples, using new components or commands, while the second part of the class focuses on students executing the planned activities by themselves and in groups. Here, the educator is encouraged to incrementally increase the difficulty of the course planned activities, taking previous examples or activities' programs and circuits as a basis for more complex ones. It is highly advised and encouraged to use good practices in programming such as flowcharts to illustrate the logic of the intended functionality and dividing the main program into multiple independent simpler functions instead of writing the whole program during the first attempt, so that the students can become more efficient and apply the same behaviors outside the school.

Finally, the project development phase focuses 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, a modern car served as a motivational factor to make students excited for what could be built at the end of the course, as well as a basis for introducing several concepts in electronics such as applications of motors, LED (light emitting diode), distance sensors, infrared receivers, LCD (liquid crystal display), 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 is not to prioritize time to completion or features involved in the project, but rather to consider projects in more abstract terms such as their originality, flexibility in operation, interactivity with the end user and visual appeal.

Throughout the entire course, the educator should provide and receive feedback 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

For Maxwell (2006), Papert and Piaget were adept of the idea that young people build their own knowledge from their interaction with the learning object. However, Papert (1991) proposed a much richer environment of stimulations and possibilities of experience. He believed that the learning process is increasingly effective the more the teaching context offers possibilities for concrete activities in which the students not only try and test, but also build a meaningful product after their interactions with objects. However, even though educational robotics provides a “building” environment in the sense discussed, like experimental activities, robotics is just an additional tool available to the teacher, which should be correctly used to be effective. In this context, the method for structuring a course proposed here contemplates in its second phase an interaction of students with the "objects" used in the activities, Arduino platform and various electronic devices and, in the third phase, the development of a challenging project to verify if the students acquired and retained the knowledge about the proposed theme.

3.1. Robotics course

In the proposal for the application of the robotics course, we proposed that every class will result in a complete activity that includes development of software, hardware and documentation of the project. The intention was to make all course activities have predefined requirements that enable 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 students not only learn the necessary programming requirements but also learn concepts related to the development of electronic and mechanical systems (hardware), and also have the capacity to carry out all project documentation. Based on the actions described above, the proposed course focuses on 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 every 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 when 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, will gain confidence to work with components, wires, measuring instruments and with the breadboard.
- **Flowchart:** Logic concepts are presented to the students. 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 students 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. 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 suggest changes to the proposed project, always questioning the students regarding the consequences of such changes. A good practice, too, would be to suggest a challenge to the participants linked to the concepts presented during the lesson.

Some of the mentioned issues coincide with the sections proposed in Rafael et al. for the execution of experiments (Alves, Silva, Pinto, Sampaio, & Elia, 2012). For example, the issues related to the material and assembly, in which we presented the list of necessary materials and how we must mount them are similar. Meantime, the approach is different, since in our proposal we also emphasize the main characteristics of all component necessary for the assembly of the experiment and how we must use the available equipments of measurement. Another example of the difference of the approach of the proposals can be seen in the issue of codification, in which we carry out the transformation of the flowchart into software (code) to execute the action of the proposed experiment, whereas in the above-mentioned work the students only copy a code previously developed by the instructors for the experiment to be executed.

The above mentioned issues proposed for the execution of a class activity during the workshop correlate with the phases of course development, indicated in section 2, as follows. The theoretical learning can be inserted in the tasks contextualization, material and flowchart; practical learning is part of the assembly phase of hardware, code development (coding) and execution of the prototype characterization built in the application. And finally, the project development stage is associated with the results discussion stage, in which the teacher should instigate the participating students to perform other tasks with the concepts discussed and learned during the course of the lesson.

3.2. Development of the mini-course

The methodology used in this work was the development of practical activities involving the use of Arduino and the IDE programming environment in form of workshops. The activities were attended by 109 students from public schools in the state of São Paulo - Brazil, and the duration of a workshop such as the one described here is from 2 to 3 hours. Supervision of the activities was carried out by 2 higher education teachers and 10 scholarship holders linked to the research, were the scholars acted as tutors during the execution of the activities. In order to promote a greater interaction between tutors and students, the activities were performed in a laboratory containing benches, computers and all the measurement instrumentation necessary for the execution of a workshop, as this provides a different environment to the participants in relation to the classrooms in the public schools they attend.

The activities proposed for the execution of the workshop were structured according to the theoretical and practical learning phases for the development of a course, as described in section 2. The activity begins with the distribution of the kits containing the necessary materials for the execution of the tasks. A presentation is held on fundamentals of programming logic as well as the Arduino platform showing students its main features and its electronic components. After a brief exposition, students may experience the use of the IDE programming environment and the use of some electronic components that will be employed in the development of activities. We finish this introductory action with the assembly of a basic project, this being an electronic light activation system. Usually, this action has an average duration of 30 minutes.

The next activity is to teach students the differences between analog and digital inputs. To introduce these concepts we present new electronic components, such as: potentiometer and luminosity sensors. At the moment, new programming structures are presented, mainly conditional programming structures. In this phase, the projects developed were the control of the brightness of a lighting system and an automatic lighting activation system. The average duration of these projects is 1 hour.

We finished the workshop by executing a challenging project, that is, this action emphasized the execution of the project development stage, presented as the last phase of the proposal for structuring a course, as indicated in section 2. Therefore, in this action the students were instigated to develop (give the solution to) a basic electronic project in the area of residential automation, with the concepts learned during the initial stages of the workshop. At this stage, students were already familiar with the IDE programming interface and with the Arduino platform, as well as with the electronic components needed to perform the task: LED, resistors, potentiometer, and light sensor (LDR). The proposed challenging project was the control of simultaneous activation of lighting of several existing environments in a residence. Thirty minutes was stipulated as the minimum duration time to execute this task.

4. RESULTS

The first Robotics Course was conducted within the planned actions of a Technological Fair called EXPRECI - Regional Exhibition of Engineering and Science. The fair included the 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 workshop 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 for each project each student in a group performed a pre-established action. In the first project 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

student was responsible for the documentation of all the stages of development of the project. At the end of each project, the members of the group took turns and began to develop a new project. By the end of the three activities (projects) all the members of the group had participated in all the planned actions of the workshop, including 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 of teachers and tutors linked to the Center for Innovation in Energy Efficiency - INOVEE of the Faculty of Engineering of Guaratinguetá - UNESP.

At the beginning and end of the activities, pre and post workshop questionnaires were completed with the intention of evaluating the results obtained from the application of the course. 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 robotics to their daily lives. It was also very interesting to find out that most students were curious about how electronic instruments work.

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 I like the content presented in the Workshop?	17	29	8	3

(*) Some students did not answer the questionnaire.

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 results presented in table we can conclude that the participants approved the proposed format of the workshop, since most of the students liked to carry out the activities, were motivated during the execution of the tasks and that they also approved the content presented in the workshop (answers to questions 1, 3, 10 and 11). The dynamics adopted for the course was 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 IDE-based Arduíno programming platform, since the great majority of the students indicated that they had difficulties in the use of this interface. One option would be to use some graphical interface to accomplish this task.

The second Robotics Course was conducted with students from a public high school in the jurisdiction of the Teaching Board of the Guaratinguetá region. This activity was carried out with two distinct classes of students enrolled in the last year of high school. In total, 46 students participated in the Robotics Course, of which 25 students participated in the first activity that occurred on August 18, 2017, and we had 21 students participating in the second activity that occurred on October 20, 2017. The activity had the expected duration of 3 hours and, during the activities, the students were divided into groups of 3 students each. At the end of the activities a questionnaire was applied with the intention of evaluating the impact of the course for the students participating in the activity. A Likert-type scale was used in the proposed questionnaire, containing the options: (1) Strongly disagree; (2) Disagree; (3) Indifferent (neither agree nor disagree); (4) Agree; (5) Strongly agree. Table 3 presents the responses presented by the participating students during the proposed Robotics Course.

Table 3.
*Results obtained after the application of the Robotics Course to public high school students.**

	1	2	3	4	5
1) There was something interesting at the beginning and during the realization of the Robotics Course that caught your attention	0	1	0	18	26
2) There was something during the realization of the Robotics Course that left you unmotivated	26	12	5	1	1
3) It was pleasant for you to carry out the activities	0	0	2	10	33
4) The content seen during the course is related to things you already knew	7	12	10	11	5
5) The content seen during the course is relevant to your interests at school or in your professional life	0	3	10	20	17
6) You were able to relate day-to-day situations with the subjects worked in the course	0	3	3	24	14
7) You realized that the proposed activities were appropriate for your level of knowledge	0	5	13	18	9
8) The implementation of the activities in the course favored the development of their capacity to work in groups	0	1	2	17	24
9) The development of the group activities in the course helped you to learn better	0	0	1	20	24
10) During the course there were times when you felt bored	19	12	7	4	3
11) You had difficulty working with the Arduino IDE programming platform	8	12	11	12	1
12) Did you enjoy performing the activities of the Robotics Course	0	0	0	7	38
13) You liked the content presented in the course	0	1	0	7	37

(*) Some students did not answer the questionnaire.

The answers to questions (1), (2), (3) and (10) indicate that the dynamics proposed for the application of the Robotics Workshop is extremely consistent with the wishes of the target audience, composed of young people aged 15 to 17 years. After a 3-hour activity, participants report that there was something interesting, not only at the beginning of the activity, but also throughout the activity to the end. Overall, students indicated that they were very motivated and that it was pleasant to participate in the course.

Analyzing the responses from question (4) we find that students still have difficulty in relating the experimental activities performed during the course with their previous knowledge or even with situations found in everyday life. This reinforces the teacher's need, when discussing the results, not only to discuss with students daily aspects where the concepts seen during the workshop are applied, but also to correlate the execution of the experimental activities carried out in the course with the content already discussed in the classroom, mainly in the subjects of Science and Mathematics.

Based on the responses to the question (11), we observed that there was a reduction of students who had difficulty using the IDE programming interface, when compared to the students who performed the activity during EXPRECI. But, even with this positive result, the work team is checking the possibility of using another programming platform for the Arduino controller to introduce the concept of programming in a more intuitive way for students participating in the course. As the vast majority of participants do not have prior experience with programming environments, we believe that it may be useful to use an Arduino graphical programming interface for the initial development of activities.

Finally, we must reiterate that the application methodology proposed in this work was very effective, since almost 100% of the participants indicated that they liked the activities they performed during the Robotics Course (answers to questions (12) and (13)). It is also important to highlight that the students stated that they liked the activity (Figure 3) and also that they feel motivated to continue the activities planned for the Robotics Course at an upcoming meeting (Figure 4). We list below some of the justifications given by students about why they would attend a new meeting on educational robotics.

"It's very interesting, I learned something new and different."
"Yes, it was very productive and interesting."
"Yes, because the activities are very interesting."
"Yes, because I really enjoyed learning new things."
"Because it was super cool and I wanted to learn more."
"Because I really enjoyed this subject."
"I found the development very interesting"
"Yes, because it is not a difficult thing to learn but rather easy for your general knowledge."
"It's motivating"

Figure 3.
What is your opinion about the proposed activities?

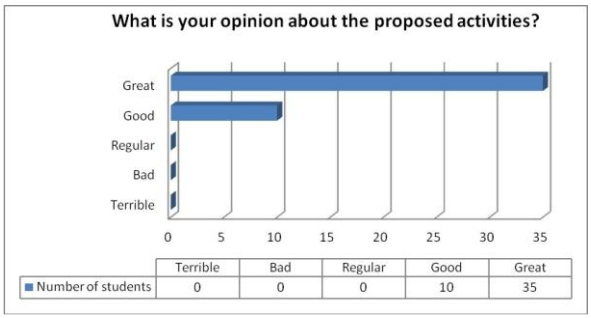

Figure 4.
Do you feel motivated to continue workshop activities at an upcoming meeting?

Therefore, at the end of the workshops, we found that the students were able to perform a challenge activity, which corresponded to an update of one of the proposed systems, so, intentionally not being a more complex project, since there would not be enough time in a single workshop. At the level of knowledge, the students, with the help of teachers and tutors, were able to relate the proposed activities to everyday situations experienced by them; at the level of understanding they could interpret the proposed specification, identifying that the challenging activity was only an update of one of the systems proposed and discussed in the course of the actions of the workshop; and, at the application level, they were able to build the hardware and software, from modifications in the codes used in previous activities, necessary to perform the task. With a view to reinforce concepts, the students were encouraged to explain to the teachers and tutors the actions taken to solve the challenge task, which they were able to accomplish at a very satisfactory level.

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 issues 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. Robotics is a multidisciplinary area, therefore, it stimulates students to seek solutions that integrate concepts from other disciplines involved, such as mathematics, physics, electronics, computer science, mechanics, among others.

It is important to emphasize the importance of the tutors in the execution of the activities, because during the execution of all the planned actions of the workshop the tutors supervised the activities performed by the students, and in this way the doubts raised were quickly remedied. We also highlight the action of interaction between the tutors (students of higher education) with the high school students of the public network of the state of São Paulo, coming to the meeting of development for citizenship, since the tutors and students of the public network, in general, come from different social contexts.

Another important aspect concerns the number of students who composed the groups in the two robotics courses described in this article: each group was made up of 3 students, a number that we could observe facilitated the understanding of the proposed activities and promoted a greater interaction between the students of the group itself and also with the tutors, creating an environment that enabled a greater exchange of experiences.

We also emphasize that the application of the course, in the form of workshops, following the method described in this article, provides an environment conducive to group work rather than individual work, and with this, execution of the activities turns out to be more productive. Joining theory and practice, the workshops of the robotics course allowed students to develop skills such as: creativity, autonomy, problem-solving ability and responsibility in performing the tasks that made up the activities.

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Chapter #13

LEARNING TO DESIGN DURING PRE-SERVICE EDUCATION

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ABSTRACT
This chapter examines design thinking as a pedagogical tool to support the learning of pre-service teachers and human services professionals. Over the course of a 10-week period fourteen pre-professionals completed design projects that involved working with children/youth, teachers, families and/or community members with the goal of arriving at meaningful and creative solutions to challenging educational and/or community-based issues. Pre-professionals learned and practiced four stages of the design process that included learning how to empathize, define, ideate, and prototype. Participants documented their progress in hand-written and hand-drawn sketch books and they also completed online surveys and semi-structured interviews. The chapter focuses on two descriptive case examples, considering affordances and barriers to prototype development while one pre-service teacher designed the prototype for an online writing game and a pre-service human services professional developed the prototype for a substance abuse learning game. Findings from this exploratory work offer suggestions for future research and the re-vision of pre-professional education in ways that incorporate design practices.

Keywords: empathy, design thinking, creativity, pre-service learning.

1. INTRODUCTION

The study of improvisation and creativity has a long history 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 the human services professions. Some conceptual writing, for example, describes how teaching involves "design work" (Jordan, 2016; Kirschner, 2015) and how design practices are implemented in the classroom (Retna, 2016). Additionally, 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 might be incorporated into pre-service education. Jordan (2016) suggests that pre-service teachers need to develop habits of thinking and problem solving that allow for flexibility and alternative solutions offering design thinking as a possible avenue for learning these skills. In practice, pre-service education emphasizes development of *planning* skills since the focus is on meeting standards and learning outcomes. As Retna (2016) notes, however, "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" (p. 5). While these kinds of conversations are just beginning within teacher education, they are not yet part of the lexicon in the human services professions where traditional program planning and evaluation skills have never been situated within the design field.

Learning to design is important in pre-professional education because this work hinges on a professional's ability to empathize with students and/or clients, setting aside professional biases to gain a deep understanding of student and client needs. When designing, professionals engage in empathy through active listening and observation skills. By immersing themselves in a student or client's experiences pre-professionals gain insights into needs and feelings in order to design activities, products and educational experiences that genuinely meet student and client needs.

The purpose of the project described here was to introduce pre-service students to design processes, offering support as they learn to confidently use tools to empathically connect with children/youth, families and community members to meet emergent needs and create their own unique programs and products. 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? The project described here is an exploratory study with the aim of examining student's involvement in the design process through the first four of five design stages (empathize, define, ideate, prototype):

1. *Empathize*: Observe, engage, watch and listen to children, teacher, etc... who are expressing a need
2. *Define*: Bring clarity to what was learned through empathy, arriving at a point of view (project scope)
3. *Ideate*: Begin creating solutions through brainstorming
4. *Prototype*: Generate artifacts that move closer to a final solution
5. *Test*: Test the prototypes by obtaining feedback from users (iterate: by using feedback for revisions)

This research takes an exploratory and qualitative approach to examining how pre-professional students move through the design process, how they engage in empathic design within a school or community, and how they view the value of this work and their learning from inception through to completion.

2. METHOD

Fourteen students enrolled in a quarter-long (10-week) online experimental course on "creative change" participated in this project. 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 (e.g., working in the foster care system, homeless services, chemical dependency, faith-based services or rehabilitation counseling). The age of respondents ranged from 20 to 31 years, with an average age of 23.7 years. The purpose of the course was to learn about creative change and social innovation designed to support schools, families and communities. Learning outcomes included the following:

- Learn and practice design thinking principles used in education, business, government and non-profit sectors.
- Examine the tools and processes associated with social innovation and creative change including sketching, mapping, digital storytelling and the use of free web-based software.
- Explore and participate in contemporary creative change movements including makerspaces, public and social labs, and global challenges.
- Analyze the application of game design thinking to health, education and human services.

Each student's final course project involved developing a product prototype related to their interest or field of study: human services, education, health or the environment. The product could be a service, game, software app. or something else of their choosing. Students learned and practiced the central stages of the design process including how to empathize, define, ideate, and prototype. No constraints were placed on the type of product to be produced.[1] Early on in the process students were required to meet with potential end-users of their product to help identify needs and gaps in services.

All of the participants identified a target population and then initially met with members of this population: youth, families, and other community members to understand needs and to learn about the types of products and services that would be useful. They then created empathy maps in the form of visual summaries of these conversations, describing what the users said, did, thought and felt. Completed empathy maps were used to suggest the scope of their projects and key elements of the prototype. Students were also required to develop a Point of View – a guiding statement focusing on information uncovered during conversations with users about their needs and their insights into these needs. Using sketch books participants regularly shared their progress related to each of the design stages with each other, receiving feedback from peers and the instructor over the 10-week period.

Pre-service students completed open-ended online survey and semi-structured interviews. All participants gave permission for their responses, process "sketch books" and prototypes to be shared for the purpose of future course development and research/dissemination. Survey data (collected mid-course) and interview questions (taking place after the end of the course) focused on the following:

- How participants arrived at a project idea and how the project evolved over the course of the quarter.
- What factors or processes helped participants complete the project.
- What kinds of roadblocks and/or barriers stalled progress. How participants overcame these barriers.
- How participants moved through boredom and failure.
- How learning from this design project might transfer to personal and/or professional life.

3. FINDINGS AND CASE EXAMPLES

All of the participants successfully completed the design process, from initial meetings with "clients" to develop empathy maps through to a final product prototype. Due to time constraints prototypes were not able to be thoroughly 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, 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 network in the community and gain employment after being released from prison.

[1] Due to the 10-week time constraint, students engaged in the first four design stages. However, they were unable to participate in the fifth stage involving testing and iteration of their designs.

3.1. Embracing challenge and failures and finding success

Analysis of themes emerging from semi-structured interviews revealed that one of the biggest challenges that students reported experiencing during the design process involved how to move from the idea to prototype. All participants noted that creating a prototype consumed significant amounts of energy. In some instances, students completely changed their products. As one student reported midway through the course, "I've decided to change course completely on my *creative change* project. Not for lack of passion or motivation, but simply because something else literally fell into my lap." Other students were not satisfied with the requirement to develop a basic prototype. They felt responsibility to the people they interviewed when developing the initial empathy map and were determined to create an operational product by the end of the course. One student noted, "I was up all night researching how to make a (software) app., and it's really not as easy as I thought it would've been. Because she wanted her product up and running by the end of the quarter she decided, "Instead of creating an app from scratch (which from what I can see takes programming skills) I am going to modify an already existing app to fit the users' needs."

To illustrate student experiences working on this design project, two case examples are highlighted, the development of a prototype for an online game for school-based students and teachers called "Open Door" and the prototype for a substance abuse treatment game for use by chemical dependency teachers and counselors and youth outside the context of formal schooling.

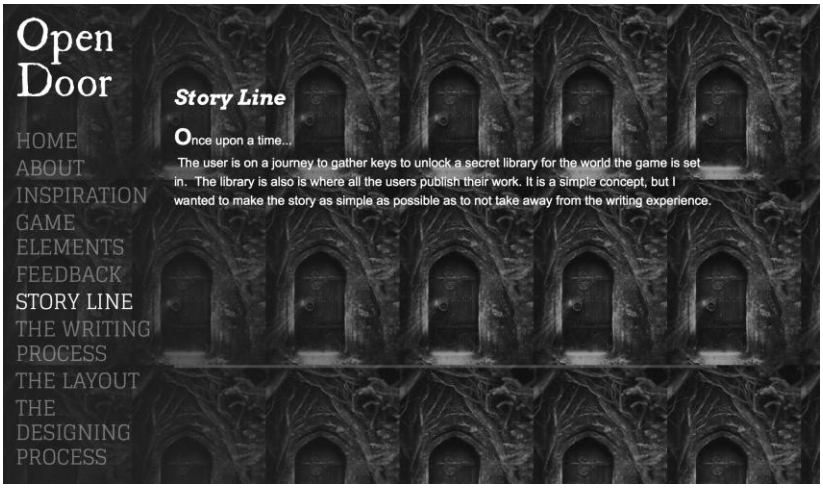
3.2. Open door

Not all students were deterred from creating products beyond their technical abilities. "Tara" expanded her original idea by creating a prototype for *Open Door*, an online writing tool and video game for use by students and teachers,

> My ideas for a writing website have expanded. I still want to do a writing website, but I want it to have a video game feel. The users make an avatar and the writing process is explored through a story line with the user's avatar. Needless to say, this is waaaaaaaay above my skill level and my proto-type will look nothing like my visions.

Despite initial concerns about her technical skill level, Tara did create a robust interactive online prototype (Figure 1). The premise of the writing game is the user is on a journey to gather keys to unlock a secret library. The library is also where the user's stories are published. The prototype calls for "cut scenes" or short instructional videos between each step in the writing process to help authors further their storylines.

Figure 1.
Open door prototype.



Tara said that she envisioned *Open Door* as being a tool to help teachers inspire and motivate students to enjoy writing in the classroom, for homework and for making it easy for teachers to access student's writing. She also viewed *Open Door* as being played for fun by kids and their friends noting, "I want the game to inspire creativity."

Recalling the design process Tara remarked that she started by writing ideas and doodling in her sketchbook. She said that the more she used her sketchbook the more ideas came to her and those ideas continued to grow and evolve. Tara ended her sketchbook with an empathy map noting, "It seems a little backward, but toward the end of my brain storming is when I knew who I wanted to reach." After completing the empathy map Tara continued to research existing products and was surprised to find that the types of free writing games currently on the web were very different from the product she imagined. Tara concluded the course realizing that she had a passion for creating educational video/computer games, but she was also fully aware that, as a student, she needed to put development of *Open Door* on the backburner with the hope of one day taking the plunge to identify start-up funding to make the project a reality.

3.3. Substance abuse education game

A second case example highlighted here focuses on the development of a substance abuse education game designed with and for youth and their teachers and counselors. "Gwen", a pre-service teacher hoping to work with students in alternative education settings after graduation, met with a group of teens in a substance abuse treatment program early in the quarter to find out more about their interests and needs. During these initial conversations Gwen learned that even though each of these youth were using drugs and alcohol, they were indiscriminate users who did not have an understanding of what these substances were comprised of or what they were doing to their bodies and brains. The youth also felt that school teachers, staff and counselors should have better understanding of substance use and abuse by teens. Gwen initially created an empathy map outlining what these teens (potential users of her product) thought and felt about the value of a substance abuse education game. She describes the process:

> We brainstormed ideas – should I create an app? No, we decided that in a group setting and a confidential venue an app wouldn't work. Cell phones aren't even allowed because they all have recording devices - both audio and video which violates Federal Confidentiality Law 42 CFR – regarding drug and alcohol information protection. How can we expect anyone (especially teenagers) to become vulnerable, open and share themselves when there is a chance they may be recorded and have their information go viral in seconds? So we decided on a board game. While rudimentary, it is interactive and fun for all. The goal is to learn, not to win.

While initially excited by the prospect of developing this substance education board game, midway through the project Gwen began to voice fears and grappled with the possibility of failure, recognizing that she would need the teens' feedback through the whole prototype development process:

> I have a fear of being wrong and not being 'perfect'. So I become frozen in time - trying to figure out what in the world I'm going to do. Being willing to make mistakes is key in this project. I am going to just do what I know - I know the information to teach adolescents regarding drugs and alcohol - I will find a way to make it fun, with the collaboration of youth. They know what is fun to them. The empathy map was so helpful to me in this regard! I'm leaning towards a board game with prizes for correct answers - they land on a certain color and draw a card - which will have a question regarding drug/alcohol education. If they get it right, they get a prize. Something to that effect. I'm willing to make mistakes

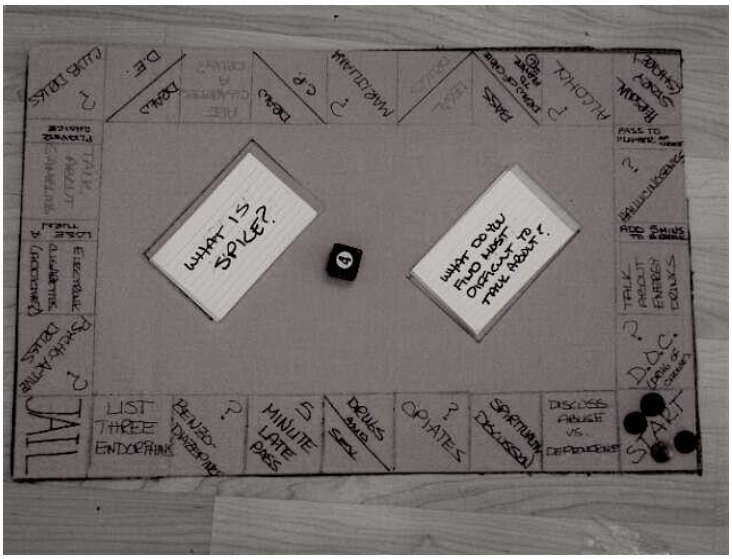
During the design process Gwen never lost sight of her initial discussions with youth. She noted that youth in chemical dependency programs are often there "begrudgingly motivated by outside influences." Thus, Gwen's goal was to create a game that was educational, fun and meaningful for this group of users. When reflecting on the design process at the end of the course she emphasized that there were many obstacles to overcome at the beginning of this project, the first being that she didn't have faith in her own ability to be creative,

> Learning that perfection isn't a reality and that mistakes are opportunities to learn was a great achievement for me. So I began to allow myself to let down my guard and be willing to be childish. I learned to have fun. As a teacher how can I teach fun if I can't have it myself? My project at this time is by no means a finished product. It is a prototype with which I am determined to streamline and improve. Ultimately I would like to patent and market this product.

When reflecting on her final prototype (figure 2) Gwen concluded,

> I hope that teens will learn something that will save them from additional agony in the future. Growing up is hard enough in itself, without being dependent on substances. I want to make a difference in a child's life. I hope that someday he or she will have a talk with their own child and say 'I once had a teacher and she taught me about substance abuse. Let me show you this game I have' That would be amazing.

Figure 2.
Substance abuse education game prototype.



4. FUTURE RESEARCH DIRECTIONS

Professional success requires solid understanding of the diverse interests, strengths and needs of the children/youth, families and communities where teachers and human services professionals work. Thus, experiences that support the development of empathy can be important in pre-service education. Traditionally, in higher education this goal has been met, in part, through service learning and other types of civic engagement projects taking place outside the classroom. The work presented here extends the conclusions of Retna (2016) and Jordan (2016) who suggest but do not examine how design can be be a valuable tool for classroom teachers and pre-professionals. The research presented here provides examples of how design thinking can be implemented in pre-service education for both future teachers and human services professionals. These types of experiences offer pre-professional teachers and human services professionals opportunities to empathically engage in the design process alongside end-users, be they children/youth, families, co-workers or community members who will benefit from their work.

The early-stage research presented here offers some findings regarding how pre-service professionals engage in the design process. What is missing, however, is a clear understanding of how empathy develops between future professionals and students, families and/or community-based clients. How might conversations designed to support the development of empathy maps contribute to prototype development, and how might the experience of participating in a design thinking course as a pre-professional contribute to later professional practice? Finally, how might the original inter-professional intent of inviting both pre-service teachers and pre-service human services professionals to co-enroll in this course contribute to a shared understanding of each other's work? While pre-service teachers and human services professionals were co-enrolled in this course, projects were individual. Future coursework and accompanying research might focus on inter-professional group projects where future teachers and human services professionals are able to work together with the goal of understanding each other's professional work and student/client needs.

From a design standpoint this project speaks to new developments in the ways that pre-professionals learn to listen and to co-create with others to improve and enhance education and services. It also helps us consider processes for developing and implementing ideas as well as learning how to address failure. One student, "Sal", noted that his greatest challenge in the course was breaking out of linear ways of thinking by learning to sketch out his ideas. "In the beginning I struggled to do this, and I would give up and then just go back to writing out some notes, and this felt like a failure in this project." It seems that later when he was able to document all of his ideas without "filtering out" possible solutions, Sal was finally able to succeed in designing the program he had hoped for. "It took being ok with my sketch not being perfect or organized and being ok with the potential for failure." Clearly, additional research exploring how the design process unfolds in pre-services education is necessary.

5. CONCLUSION/DISCUSSION

The inspiration for the work described here emerged from a desire to support pre-service professionals to become agents of change in schools and communities. Likewise, involvement in the design process in a way that encourages children/youth, families and communities to play a role in shaping their own engagement with professionals in schools and community-based agencies was also important. There is a historical tendency for new teachers and human services professionals to draw on pre-planned programs and pre-existing lessons and curriculum packages. However, the goal here was to introduce pre-service students to design processes and support them as they learn to confidently use tools to empathically connect with children/youth, families and community members to meet emergent needs and create their own unique programs and products.

While the course described here required students to create a prototype, the basic building blocks of empathy, design thinking and the willingness to risk failure can be used in a wide variety of professional situations and are consistent with seminal pedagogical theories of Dewey (196), Vygotsky (1986) and Freire (2000) that support teachers, students, families and communities as design agents. As one student concludes,

> Design thinking makes the impossible possible – there are no limits to brainstorming and day dreaming. The limitations come when you get to the prototyping, but then you problem solve through or around those limitations. Overall, I think exploring design thinking reminded me that there are no limits to what I can do and create. It took down the boundaries that I have created going through the busyness and craziness of professional life. We can do great things through design.

Problem solving through and around limitations is at the heart of design thinking and is an important element of professional work that is not always emphasized in pre-professional education. Yet, finding time and opportunities for pre-service students to engage in this type of work is not easy. Design is a messy process and relies on a skillset that has not traditionally been privileged in education and human services, raising questions about how this type of learning can be sustained in pre-service education. Yet the need remains for pre-service professionals to enter the field with a robust set of tools that they can use to connect empathically to solve problems, design programs and tackle future challenges that arise during their careers.

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Chapter #14

RAPID ENROLMENTS IN HIGHER EDUCATION: IMPLICATIONS ON TEACHING AND LEARNING

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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 enrolment figures in tertiary institutions. This book chapter examines the implications of rapid enrolments on teaching and learning in higher institutions of learning in Botswana. Through a qualitative approach, semi-structured interview questions were used to elicit information from lecturers and students of two selected institutions of higher learning in Botswana. The chapter concludes by providing some possible solutions to the challenges posed by rapid enrolments in higher education.

Keywords: rapid enrolments; higher education, implications, teaching, learning.

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. As Killick (2005) states, higher education has expanded rapidly over the years, both in terms of absolute numbers and the population it serves. The global enrolment in higher education increased from a hundred million in the year 2000 to one hundred and seventy seven million in 2010, representing an average increase of about 7.6 million students per annum (British Council Summary Report, 2012).The unprecedented increase in the global enrolments in higher education could be attributed to , changes in the legislations and policies of nations, increased demand for students at the higher education level, internationalisation and globalisation of higher education. Botswana formulated 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 Batswana (RNPE, 1994). Government's efforts to provide education to the people was further strengthened in 2007, when it started sponsoring students in higher education at private institutions of higher learning in Botswana. This initiative by the government contributed immensely to the rapid enrolments in higher education in Botswana. Botswana is one of the countries witnessing the current wave of globalisation and internationalisation of higher education .Globalisation refers to the trends in higher education that have cross-national implications such as mass education , a global market place for students and faculty, highly educated personnel and a global reach of the new internet-based technologies .It is evident that institutions of higher

learning ,both public and private, are fast evolving into global actors, a trend found in many other industries(Altbach & Knight, 2007; Altbach & Teichler, 2001). Internationalisation of higher education on the other hand, refers to the process of integrating an international , multicultural and global outlook into all aspects of higher education (Sehoole, 2006; Iloanya, 2013).Several terms such as , borderless education, multicultural education, global or offshore education have been used to define internationalisation of higher education (De Wit, 2001). The globalisation and internationalisation 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. Over the past two decades, higher education institutions have gone on a critical redesigning of their character and operations across the globe. There have been extensive increases in numbers of programmes, as well as institutions which operate internationally. Institutions are also paying attention to international and global recognition, as they also continue to operate not only within their borders but, even outside their countries of origin. This has broadened access to education as more students are enrolled into higher education programmes (Ntim, 2016; Moabi, 2017). This situation which is not unique to Botswana, is also being experienced in other countries of the world. China, Taiwan, South Korea, Japan and Hong Kong have recorded dramatic increases in higher education enrolments (Mok, 2008; 2016).

The driving force behind rapid enrolments in Higher Education differs from one geographical area to the other. Rapid enrolments in higher education was triggered off by the financial boosts given by several countries to improve higher education in the 21st 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 work 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 realised the benefits accruing from higher education, the more the institutions of higher learning expanded 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 they have a direct effect on the access to higher education institutions, hence, increases in enrolments (Misaro, Jonyo, & Kariuki, 2013).

In Africa, the main reason for rapid enrolments in higher education could be traced to the pressure from secondary school leavers wanting to further their education. Rapid population growth mainly among the 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 dramatic increases in higher education enrolments. 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 triggered an increase in higher education enrolments (Lusenge, 2016).

In 2007, the government of Botswana extended its education sponsorship initiatives into higher education, from public higher institutions of learning to privately owned higher education institutions. This was a fundamental step in the higher education landscape which it could be said, further led to rapid enrolments in higher education in Botswana. The 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). To encourage more enrolment in the higher education sector; Botswana government established a Tertiary Education Council 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 increase in student enrolment was further recorded over the five -year period of 2009/10 to 2013/14. An increased enrolment at the higher education level comes with some opportunities and of course, some challenges too.

This chapter examines the various implications rapid enrolments in higher education have on teaching and learning in Botswana. It discusses the benefits and opportunities accruing from massive increases in the enrolments at the higher education level; the challenges posed by massification and how these challenges could be addressed to ensure a favourable environment for teaching and learning in the face of rapid enrolments in Botswana's higher education institutions.

1.1. Rapid enrolments (massification) of higher education

Massication 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 2013). 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 enrolment 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 terms, the gross enrolment hardly exceeded 5 % (Mohamedbhai, 2008). This obviously implies that, developing countries did not experience similar rate of massive enrolments across their borders. With rapid enrolments, higher institutions of learning tend to compete with one another not only in 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 (1987; 2009; 2012) 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 ; Teferra & Altbach, 2004).

2. BACKGROUND /THEORETICAL PERSPECTIVES

This study draws from the theory of Egalitarianism. The theory of egalitarianism emphasises on equality and equity in wealth, education and status. Marginson (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 enrolments.

There is presently more demand for higher education than before and this has resulted in massive student enrolments. Many people are yearning for higher education in many societies all over the world. There seems to be no decrease in demand soon (Altbach, Reisberg, & de Wit, 2017). The challenge the world is facing is how to accommodate the multitude of millions of students qualified to study at a university but who are unable to do so, as it seems that, the existing universities do not have the capacity to accommodate them (Grobler, 2013).

National governments have realized that higher education has big contributions to make to the growth of their economies (Misaro et al, 2013; Manyasi, 2010). The World Bank (2002) supported this stand when it asserted that such education contributes to social cohesion of a nation. At an individual level, many people have realized that higher education contributes to improved standard of living (APEID-UNESCO, 2006; Manyasi, 2010). This has some impact on University enrollments world over.

2.1. Higher education enrolment trends in Botswana

2.1.1. Brief history of higher education in Botswana

The University of Botswana started as part of the University of Basutoland, Bechuanaland and Swaziland, and later renamed University of Botswana, Lesotho and Swaziland (UBLS) which collapsed in 1975. Later it was transformed into the University of Botswana and Swaziland (UBS), comprising the University College in Gaborone (offering economics, social studies and natural science programmes) and the University College in Kwaluseni (offered law programmes). The colleges developed their infrastructural and academic resources at a high pace during their life time. UBS was dissolved in 1982 and the University of Botswana and the University of Swaziland were established as autonomous higher learning institutions. The University of Botswana engaged in major changes in governance and expansion (http://www.ub.bw/content/id/1366/History/). In 1990 eight new faculties were established, while in 2008 a White Paper on Higher Education that projected increases in the gross enrolment ratio (GER) to 17 per cent by 2016, and then to 25 per cent by 2026 was issued (https://www.google.com/search?q=2008 white paper on higher education).

Higher Education in Botswana is provided by both public and private universities. Public higher education institutions are the responsibility of ministries and departments of government, while private institutions are run independently of government control, except for academic quality and curriculum development matters, which are regulated by the Botswana Qualifications Authority (BQA). A rapid enrolment in higher education was experienced in Botswana for the first time in 2007 because of government sponsorships of students being extended to private tertiary education institutions. The post-secondary education enrolments then rose from 18,144 in 2005 to 31,129 in 2007, while enrolment ratio rose from 7.5% in 2005 to 8.2% in 2007 (TEC, 2011). There has been continued rise in enrolment numbers and ratios in years after 2007. The tertiary enrolment rose from 31,129 students in 2007 to 37,859 in 2011, while enrolment ratio rose from 8.2% in 2007 to 13.4% in 2011(Molutsi, 2009)

In private universities, enrolment declined from 45 per cent in 2008/2009 to 41 per cent in 2009/2010 and further declined to 35.2 percent in 2010/2011. In 2009/2010 there were 24,996 students enrolled in public tertiary institutions, constituting 59 per cent of the higher education student population, while 17,370 students (41 per cent) were enrolled in private institutions (TEC, 2011). The combined private tertiary education enrolment was

followed by the University of Botswana with 34 per cent, while other publicly funded tertiary education providers accounted for only 25 per cent (with the Botswana Wildlife Institute enrolling the smallest number of students). The University of Botswana enrolled 18,176 students in the 2013/14 academic year.

The University of Botswana Fact book (2011/12) shows that the University enrolled a total of 15,484 students in 2008 (12,401 full time students, 2,584 part-time students, 499 distance-learning students); 14,420 students in 2009 (11,348 full time students, 2, 548 part-time students, 524 distance students); and 14,706 students in 2010 (11,587 full time students, 2,614 part-time students, and 505 distance students). Teaching staff were 831 in year 2007/08; 848 in year 2008/09; and 798 in year 2009/10, although no reason is given for the decrease in numbers for year 2009.

The University of Botswana library books were 382,909 in 2007/08; 436,122 in 2008/09; and 450, 771 in 2009/2010. Pamphlets were 18,069 in 2007/08; 30,305 in 2008/09; and 31,308 in 2009/10. Periodical Titles were 1,130 in 2007/08; 1,130 in 2008/09; and 1,027 in 2009/10. Full text Journals were 30,428 in 2007/08; 40,237 in 2008/09; and 96,714 in 2009/10. Internet Public Access Catalog terminals were 13 in 2007/08; 7 in 2008/09; and 6 in 2009/10. Internet Dedicated Workstations were 186 in 2007/08; 189 in 2008/09; and 182 in 2009/10. Registered Users of library were 25, 000 in 2007/208; 21,799 in 2008/09; and 19, 901 in 2009/10. The seating Capacity in library stood at: 1,151 seats in 2007/08; 1,151 seats in 2008/09 and 1,168 seats in 2009/10. The university has Wi-Fi campus, 2,400 personal computers for staff, 2,600 personal computers for students, and only 350 personal computers are accessible for 24 hours (University of Botswana website).

Enrolments at Botho University, which is a private university, stood at 5472 students registered in 2013; 5598 in 2014; 5165 in 2015 and 4561 in 2016. Library seating capacity is still small due to available space being small. However, this is compensated by tablets given to each student to access e-learning materials. The university has many computer laboratories with seating capacity of more than 300.

There have been increased student enrolments and some universities are failing to cope with such increases. The demand has been precipitated by among others; the need to create prospects for future careers. Moreover, there is belief that there is no longer a hindrance to anyone who has no entry qualifications since the universities will always have a way to supplement their qualifications by bridging courses. Above all there is large number of universities established to accommodate many students. Unfortunately, the demand seems to be more than the available resources to make teaching and learning more worthwhile.

Most universities in developing nations have recorded student enrollment increases with no corresponding systems to take care of such increases. African governments agree that there must be democratisation of higher education and access to the same. With contraction of resources, while demand for higher education increases; African governments are far from meeting the requirements, in terms of the resources to match the rapid increase in enrolments. Policy makers are challenged to create a higher education system that will meet the required standard with regards to teaching and learning. Moreover, where fees are charged, such institutions have resorted to admitting less qualified students. Other challenges relating to mass enrolments relate to change in student body and what they desire in their quest to acquire university education. This creates the need for diversity of programmes and impacts on the funding provided by the government in some African countries.

3. METHODOLOGY

The study was carried out in Gaborone, the capital city of Botswana. There are about twelve tertiary institutions in Gaborone, both public and privately owned. Two universities were used for the study, one is a public university, while the other one is a private university. The decision by the authors to use both a private and public university was motivated by the fact that, a simple comparative analysis of the implications of rapid enrolments in both institutions would throw more light on the true situation with regards to teaching and learning, as far as increased enrolment is concerned in Botswana. Using a qualitative approach, participants for the study were purposefully selected from the two institutions of higher learning. Qualitative approach was deemed appropriate for the study because, in qualitative research, the researcher carries out studies about people's experiences in their natural settings and humans form the focus of the study (Chilisa & Preece, 2005; Creswell, 2013). The problem of rapid enrolments in higher education can best be studied through a qualitative approach which allows the researcher to have a face-to-face interaction with the participants and draw out meanings from their experiences on the issues being investigated.

Ten lecturers were selected from each university, making it a total of twenty lecturers. Sixteen third year students were purposefully selected from each university used for the study. Focus group discussions were used to elicit information from the students. The discussions centred around the various implications of rapid enrolments on teaching and learning processes in the institutions of higher learning in Botswana. There was need to find out from the participants, the effects of increased enrolments of students on teaching and learning. Both students and lecturers had the opportunity to share their views on how rapid enrolments in Botswana higher education impacts on teaching and learning.

4. MAJOR FINDINGS AND DISCUSSIONS

The findings of the study relate to two major issues concerning the impact of rapid student enrolment on teaching and learning in higher education. Some major themes emerged from the study based on the interview questions used to collect data from the participants in the study.

4.1. Implications of rapid student enrolments on teaching and learning

Findings from the lecturers and students interviewed revealed that, rapid enrolments in higher institutions of learning, could have some negative and positive effects on the process of teaching and learning. One of the shortcomings of rapid enrolments in higher education, on teaching and learning is high unfavourable teacher -student ratios resulting in impaired teacher-student interaction. It is imperative that teachers know and interact with their students. In this era of outcomes -based education where emphasis is on allowing the students to make enquiries and discover things for themselves through an active and performance based teaching and learning, teacher-student ratios should be realistically set for good teaching and learning to take place. With rapid enrolments in higher education, effective teaching and learning might be difficult to implement if university teaching takes place mostly in large lecture theatres. Individual differences abound in students, and it might be difficult to structure classroom learning to incorporate the interests and learning abilities of all students when teachers do not know their students' abilities and challenges. Perhaps, this should be a clarion call for teachers to have a look at the curriculum to enable them meet this important demand. The interviewees in both institutions did admit that, in a

normal classroom with a moderate number of students, the teacher -student ratio is between 1:20 to 1:30. The Tertiary Education Council student demographics report (March, 2007) recommends a teacher-student ratio of 1:16, but, due to increased enrolments in the number of students, for courses/programmes, it is difficult to put this into practice in the institutions of higher learning used for this study.

The lecturers interviewed, revealed that, student engagement process is affected by increased enrolments in higher education. This is worse in institutions where the resources do not match with the increasing number of students. This scenario causes a move towards lecture method of teaching negating interaction between teachers and students. Lack of student accommodation and facilities hamper smooth running of the institutions because of increased enrolments in institutions of higher learning. One of the participants interviewed disclosed that, "massified environment brings about constraints arising from being outside the school environment due to lack of accommodation in schools". Sadly, these students see their classrooms as the main university experience they can recount after leaving the institution. Poor classroom facilities, students' accommodation and inadequate library facilities are some of the burning issues plaguing rapid enrolment in higher education. This situation no doubt has effects on the teaching, learning and assessment processes. The labour market seeks quality graduates who can perform at the work places up to some required and acceptable standards. The effect of inadequate resources towards the production of fit-for-purpose graduates cannot therefore, be underestimated in this regard.

The challenges emanating from rapid enrolments of Higher Education are not insurmountable. Some possible solutions could help alleviate these problems. Institutions could help solve the problem of physical space by using distance learning mode to facilitate teaching and learning. With the use of modern educational technologies such as, Moodle, Blackboard, MOOCs etc., online teaching and learning could be as effective as face-to- face mode and at the same time save the much-needed space in the face of rapid increases in students' enrolments. MOOCs could be said to be the aftermath of web-enhanced courses, blended learning, and online web-based courses. Even though MOOCs are noted for their high dropout rates estimated at more than 50%, and other shortfalls, MOOCs have been considered as a possible solution to some of the problems facing higher educational needs in the world, including rapid enrolments.

It is advisable that, both public and private institutions of higher learning realise the urgent need to carry out a needs assessment analysis when preparing their programmes. One of the advantages of rapid enrolments in higher education is the opportunity afforded to a wide range of students to gain access into institutions of higher learning. Unfortunately, the resultant effect is the production of graduates who may not be employed after graduation. There is need therefore, for institutions to carry out adequate needs assessment to ascertain if the programmes in place match with the requirements of the job market. The situation on ground seems to be tricky because as one of the lecturers interviewed put it, "public institutions of higher learning are likely to control the numbers to be enrolled due to budget constraints, while private institutions enroll without limit to maximize incomes and profits". In simple terms, the solution to needs analysis as indicated by the interviewees may not be forthcoming soon.

4.2. Benefits of rapid enrolments in higher education

One of the major effects of increasing enrolments 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.

Rapid enrolments have 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.

Massive enrolment in higher education has made an enormous contribution in 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 to face the technological challenges of the 21st century (Republic of Botswana, 1977; 1994). Increase in enrolment is a democratising process to higher education and Botswana believes in the implementation of the principle of democracy (Iloanya, 2010; Adeyemi, 2010).

4.3. Rapid enrolments in 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 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 for the expansion of students' facilities such as, lecture rooms, 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 a need for 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 duties. One would find that, even the full- time staff members 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 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 declining state of the world economy, rapid enrolment poses a great challenge. Although 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 in Botswana's institutions, causing boycott of classes and in some cases, destroying valuable facilities in their institutions. Why? They are frustrated with challenges that rapid enrolments in higher education pose.

Massive enrolment poses the danger of producing graduates over and above market demand. Botswana is currently experiencing unemployment due to high turnout of graduates from the country's tertiary institutions. Mis-alignment of the curricular to the needs and demands of the market is one big problem created by rapid enrolment in higher education. The country produces a large number of graduates who are unfortunately, not needed in the labour market. The result is a feeling of apprehension and frustration by these graduates, parents and the society.

5. FUTURE RESEARCH DIRECTIONS

This study has revealed the implications of rapid enrolments in higher education institutions in Botswana. There are benefits and challenges arising from the increasing number of enrolments. As the youths have more opportunities of having higher education experiences, the question is how far are the institutions prepared to meet up with the increasing demands in terms of resources being made available to match the increase in the number of students. This study was carried out in the context of Botswana. It would be beneficial to carry out future research in other parts of Southern Africa in order to draw comparisons between higher education institutions across the region so as to ascertain if the effects of increased enrolments cutting across the institutions in the region are the same or differ.

6. CONCLUSION

Rapid enrolments in higher education is a contemporary issue and one cannot shy away from the fact that, 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 massive enrolment; 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 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 rapid enrolments if the same lecturers are to set exams and mark for the large number of students. This leads to the issue of staffing. Institutions must engage and retain quality teachers to drive the vehicle of quality teaching 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 to determine the costs of higher education.

Institutions should enroll 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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Section 3
Teaching and Learning

Chapter #15

DYSGRAPHIA, EDUCATIONAL INTERVENTIONS AND DIDACTIC IMPLICATIONS: FROM PREVENTION TO INTERVENTION[1]

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ABSTRACT
Dysgraphia is a widespread disorder among school children. The prevalence for developmental writing disorders is about 7–15% among school-aged children (Döhla, & Heim, 2016; Katusic, Colligan, Weaver, & Barbaresi, 2009). It has become clear now that learning to write has an unquestionable educational value. According to Konnikova (2014), it is not only what children write that matters, but how they write. That's why we need to examine and understand which education and didactic methods can be useful to teach handwriting to those children that find it difficult or that, despite all the efforts, have an unreadable handwriting. It is also necessary to investigate the best way to intervene, especially since writing difficulties are often related to other learning disabilities.
This paper contains the conclusions of a lengthy period of observations and data collecting on those children identified by the authors, who suffer from writing difficulties. This work was aimed at identifying an educational working methodology to prevent writing difficulties or recover from them. We will describe here early manifestations of dysgraphic disorder and show efficient educational and didactic intervention tools within the school context.

Keywords: dysgraphia, prevention, specific learning disorders, motor education, special education.

1. INTRODUCTION

The University of Verona and its Department for Human Science - in a research on specific education for impaired children (Sangalli, 2003, 2005; Larocca & Sangalli, 2005, 2006; Lascioli & Sangalli, 2009; Lascioli, 2011) - has carried out a project aiming at developing several specific educational interventions to prevent and correct learning disorders. Combining experience in the field with scientific observation and research has demonstrated that intervening and taking focused and special education-related actions, can improve - sometimes even remarkably- the learning ability of impaired children.

A research methodology of the empiric type has been used, through which efficient educational strategies or didactic actions have been selected on the basis of experimental evidence (Evidence-Based Education), that is, capable of functioning in a wide range of contexts (Calvani, 2012, p.10).

In the research presented here, we have identified special education-related interventions that we have tested while treating writing difficulties both in children with certified impairment and in children without a well-defined clinical diagnosis. We have described specific educational and didactic intervention tools which we have identified and

[1] The chapter is the result of the joint work of the three authors. For the sole purpose of identifying the parties, Angelo Luigi Sangalli is the author of paragraph 4, Angelo Lascioli of paragraph 3, Andrea Lascioli of the introduction, paragraph 2 and conclusions.

tested while treating writing difficulties in both impaired and non-impaired children. We have achieved significant results improving both writing and learning abilities.

Taking educational actions on precursors of school performances (Asonitou, Koutsouki, & Charitou, 2010), but in general on all children, in order to prevent learning difficulties during school years, represents an important contribution for promoting and developing Inclusive Education (European Agency for Special Needs and Inclusive Education, 2014).

The problem is that still too little is known about written expression disorders, which can also occur in the absence of a reading impediment, intellectual disabilities, problems of visual acuity or inadequate education. Being able to learn to write in a legible manner is for many children an insurmountable problem, not without consequences for their progress in other aspects of learning, for which, in many cases, there is no known solution. (apart from compensatory measures). Hence the importance of identifying methodologies of intervention that offer operational guidance for such interventions to educators in pre-schools and teachers, both in terms of prevention and rehabilitation and that are adept at finding case by case "where the problem is", "what it consists of" and "what is to be done" to help the children overcome it, putting into effect the available resources in the normal educational and/or didactic contexts.

2. VARIABLES INFLUENCING HANDWRITING ABILITY

A recent exploratory study (Lopez, Hemimou, & Vaivre-Douret, 2017) showed that immaturity in the handwriting gesture is a possible underlying mechanism responsible for poor handwriting. Dysgraphia is associated with specific impairments in spatial organization of letters and in motor control of handwriting gesture. Handwriting is in fact influenced by different factors ranging from cognitive skills (like intellectual ability) to - even more important - specific sensory and motor skills (like spatial-visual or fine motor abilities) (Tseng & Chow, 2000). Children with handwriting difficulties seem, in fact, to fail in the praxic component, in particular in the spell-check related skills, and more specifically in the hand-eye coordination (Goldstein, & Britt, 1994; Sovik, 1975, Sovik, Arntzen, & Teulings, 1982). Evaluating handwriting difficulties requires, therefore, a careful observation of the graphic gesture, i.e. the way in which children control the graphic tool while drawing the graphic sign, giving particular consideration to the movement of the arm, of the hand and of the fingers (Thomassen, & Teulings, 1983) It requires also a careful observation of the graphic space, i.e. the way the sight and the spatial organization work (Mati-Zissi, & Zafiropoulou, 2003). Researches investigating the prevalence of cultural and linguistic variables in the development of handwriting (Margolese, & Kline, 1999) have also confirmed that the praxic components play a relevant role and value for the identification of the pre-requisites for the correct development of the handwriting skills.

Eden and colleagues (1995) have discovered that children with learning disorders generally perform below the level in tasks that require speed and sequential processing. These skills depend, in fact, on sensory, motor and visual perceptive skills as well as from visual motor coordination (or visually guided motor behaviour).

Acquiring specific sensory motor skills can influence those brain processes, which are responsible for cognitive functions governing more complex learning processes (Kulp, Edwards, & Mitchell, 2002). The value and relevance of these skills for preventing learning difficulties at school has also been largely demonstrated in recent studies (Wang, Tseng, Liu, & Tsai, 2017). And this was also the point of view characterizing the present research and the relative observations in searching for pre-requisites to attain correct handwriting. These prerequisites are necessary both for preventing dysgraphia and for defining possible educational and didactic interventions to treat such disorder.

3. SEARCHING FOR PREREQUISITES FOR HANDWRITING ABILITY

In this section we present what we - through our research - have defined as essential prerequisites children should have to attain correct handwriting (Lascioli & Sangalli, 2009; Sangalli, 2011).

3.1. Head and shoulder control

Our observations and research have clearly demonstrated that children who have not developed a good head control and / or possess a low shoulder tone, might also encounter problems using their hands while handwriting. Difficulty controlling the head also generally results in difficulty using the hands: this becomes even more evident, but not exclusively, in children with motor deficit. The graphic gesture, in these cases, requires an excessive effort. There might be excessive shoulder movement and the writing gesture becomes therefore heavy and gross. Sometimes the hand grasp is too high and the wrist does not lean on the horizontal plane (this condition usually occurs in hypotonic children). The head may sink between the shoulders and by turning around, eyes and head are unable to perform any anticipatory movement independently from the trunk. Even when walking, the movement might not appear well coordinated.

3.2. Proper muscle tone

Pupils with muscular hypotonia deriving from genetic syndromes (like the Down Syndrome) get easily tired from writing. A lack of proper muscle tone is a common cause of severe fatigue from handwriting because it does not allow children to grasp the necessary graphic tool properly with the hand. These children get tired very easily, even when scribbling; they keep on moving the graphic tool from one hand to the other and often end up abandoning what they are trying to do.

3.3. Stable sitting posture

Children who sit improperly on the chair, who cannot reach the floor with their feet flat or cannot lay their arms properly on the table because it's higher than their elbows, are constantly searching for better posture. This constant postural adjustment interferes with the graphic production. On the other hand, stability in the sitting position allows major concentration in the motor task, especially for children with poor motor control.

3.4. Hand (haptic sensation)

A proper haptic perceptual organization of hands and fingers allows children to handle the graphic tool properly. Children with good haptic sensation can feel the tool properly and scale the force output with respect to the object they grasp. Thanks to the sensory receptors on the hand skin different kinds of haptic experiences (proprioception) are possible. For the purpose of our research it is useful to differentiate between superficial touch (which depends most of all on cutaneous receptors) and deep touch (which depends on encapsulated receptors: baroreceptors). An insufficient proprioception of the hand may hinder the process of learning correct handwriting. For example it might lead to difficulties in the perception of superficial haptic experiences and therefore with the perceiving and/or grasping of the writing tool (for example children might not use enough strength to grasp the pen or the pencil, or enough pressure to draw a visible graphic sign). It might also lead to difficulties in the processing of deeper sensory information (pressure) which result in opposite problems when grasping the writing tool: for example children might use too

much strength while holding the writing tool or too much pressure while writing on the piece of paper. They get easily tired, frustrated and, in most cases, give up very soon (by exerting too much pressure they make a hole in the piece of paper with their pen or they cause themselves soreness where the skin presses against the pencil or pen). Alteration of haptic sensation like Hypersensitivity or Hyposensitivity, forces children to hold the tool between the fingers with exaggerated strength (in order to feel it better) with the result that even the graphic sign is over marked. In these cases, children usually get easily tired and give up. Other children with altered haptic sensation, on the contrary, hold the graphic tool with insufficient strength. In these cases, the graphic sign is almost invisible and unmarked. The pencil keeps on slipping out of their hands and they cannot carry out the writing task. Issues in the haptic perception tend to delay the development of manual skills in children. Children who suffer from autism or Asperger syndrome very often have sensory processing disorders (Tomchek & Dunn, 2007; Bogdashina, 2016). These disorders imply difficulties with perception, modulation, integration and organization of sensory stimuli (Bundy, Lane, & Murray, 2002) with evident implications also in the use of hands as tools (Sangalli, 2009).

3.5. Visual convergence and accommodation

According to the research carried out by Tseng and Chow (2000), the three significant predictors for slow handwriting are age, visual sequential memory and visual-motor integration. In particular a correct visual convergence should allow children to keep the face at a distance of 20-40 cm from the table, to focus the image clearly, to write and to draw. Issues with visual convergence may be the cause for specific behaviours which prevent the children from focusing on their task. For example, children that keep looking around and not at the piece of paper while they are colouring. Convergence problems are the reason why eyes do not follow what the hands are doing (Larocca, & Sangalli, 2005).

3.6. Brain dominance

It has been observed that if establishment of hand dominance is delayed, the organization of a specialized movement scheme is likely to be problematic. Problems also arise with wrong limb selection (either in case of constraint or because the child has difficulties in establishing a preferred hand autonomously).

3.7. Running with contralateral gait pattern

We have found a significant correlation between coordinated running and difficulty in writing. Pupils with handwriting problems (in particular related to wrong grasp and poor wrist control while colouring) also have problems with contralateral gait pattern. These children run in an uncoordinated way, their arms do not swing at the frequency of the contralateral leg, resulting in a disharmonious movement. According to the maturation theory, children develop motor skills with a cephalocaudal trend (head and axis control precede limb control) and proximaldistal trend (from the centre of the body outwards). This is the reason why an incomplete development of arm control is reflected in the ability to use hands: we have observed this in children who hold the pencil too high with respect to the table or, in any case, in a wrong way.

3.8. Correct hand grasp

A correct hand grasp depends on whether children have acquired the graphic motor pattern suitable for handwriting. Correcting hand grasp appears, therefore, to be a successful intervention for improving the handwriting. Correction cannot, however, take place simply with writing tasks. If pupils learn to write with a wrong grasp, writing exercises are not suitable for correction (it is wrong to correct a writing issue while exercising writing itself) because children can concentrate either on listening and looking at the shape of the letters or on doing the correct writing gesture. Only when the writing gesture becomes automatic, pupils can concentrate on listening and on looking at the shape of the letters while writing. Repeating the writing task is not useful at all. It would be better to use other exercises suitable for developing the correct motor automatism for handwriting gesture. This takes time and practice and rarely comes from a spontaneous self-correction. Teaching children how to improve the grasp so that they gradually abandon the incorrect pattern is therefore preferable.

3.9. Hand-eye coordination

Hand-eye coordination is a fundamental field of intervention in teaching handwriting. This field of intervention also includes the development of a correct visual perception of the space on the worksheet (Decker, Englund, Carboni, & Brooks , 2011). In fact, children lacking coordination between their eyes and their hand do not have a sufficient visual perception of space. They often do not use the entire available space and scribble on the same spot (Larocca & Sangalli, 2006), sometimes even making holes in the piece of paper.

3.10. Controlled mark by colouring (3 different typologies)

It has been noticed that pupils suffering from dysgraphia are low skilled also in colouring. Assessing this skill in children can be useful to predict future dysgraphia. By looking at colouring tasks it is possible to evaluate the stage of the maturation in the hand motor control of children. Through observation we have identified three stages in colouring that reflects stages in the child's organization of the graphic gesture:

- First stage: controlled mark at the edge of the Figure.
- Second stage: independent mark control and wrist control.
- Third stage: wrist rotation and autonomous movement with fine finger motility.

3.11. Wrist control

The wrist and its motor organization are fundamental for developing a correct handwriting gesture. A high grasp or a rigid wrist in holding the writing tool, are likely to reveal a dysgraphic disorder.

3.12. Wrist pressure

Also the pressure that the hand exerts on the worksheet is a valid indicator for assessing writing-related motor skills. Suspects arise when the children use too much pressure (and end up tearing the sheet) or, on the contrary, when the mark is almost invisible.

3.13. Finger motility

Handwriting is a fine-motility gesture. Dysgraphic children have not reached a sufficient finger motility to carry out the movement required for handwriting. The handwriting gesture is therefore slow and inaccurate, often carried out with wide movements of the hand, which should compensate the lack of finger motility.

3.14. Shape orientation with respect to squares, lines and worksheet

Having a correct perception of the shape with respect to the worksheet space is one of the most important prerequisites for developing a good handwriting. Difficulties in perceiving the space on the worksheet, also results in difficulties in visualizing specific shapes. Children who fail to reproduce the original graphic sequences of shapes and to maintain the same shape orientation probably have difficulties with spatiality in general (that means visual orientation of the worksheet), and tend to overlap letters. That is because letter orientation is difficult for children who do not properly perceive the space in which they operate.

4. POSSIBLE EDUCATIONAL INTERVENTIONS

In this section we will present different educational interventions that can be carried out when the prerequisites that we have identified so far for good handwriting have not been sufficiently developed in children. In order to choose the right type of exercise, it is important to assess first of all the handwriting prerequisites in children. During the assessment, the teacher should determine case-by-case, which type of intervention is the most suitable for the child. Our experience in the field has allowed us to verify that there are neuro-genetic correlations among the prerequisites, so the failure to develop some prerequisites may affect the acquisition of others. We have also noticed that if no recovery measures are taken and, despite their efforts to autonomously compensate the lack of these prerequisites, children do not obtain the desired results and their handwriting difficulties persist. The order of pre-requisites we have chosen reflect, in our opinion, the neuro-motor organization of the handwriting gesture (Lascioli & Sangalli, 2009) so even the teacher's assessment should take place following this sequence.

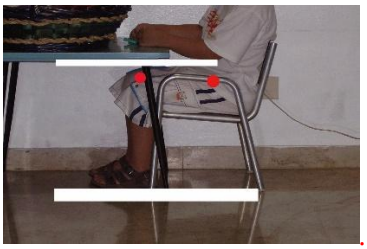
4.1. Head and shoulder control

Children lacking this prerequisite should have training in gross motor activities like walking or crawling, as well as doing psychomotor exercises with a ball, games with vestibular or sensory stimulation and crocheting activities. If these playful activities are still not enough for recovering the prerequisite, one should seek the advice of an expert in physiokinesitherapy. This becomes, however, essential if children have no head control. In fact, we have noticed that, in this particular case, educational activities involving the use of hands do not lead to positive results (Sangalli, 2005).

4.2. Stable sitting posture

The most suitable posture for organizing the writing gesture is sitting on a chair that allows the child's feet to rest well on the ground, and the child's knees to be slightly higher than the pelvis. Tables should be placed at a suitable height, so that children can lay their arms on the tabletop and their elbows form a right angle with the table top. This posture allows the child to stabilize the trunk and make better use of their hands (Figure 1).

Figure 1.
Optimal posture.



4.3. Proper muscle tone

In many cases, difficulties in handwriting are related to hypotonia. It becomes, therefore, necessary to develop a proper muscle tone (to improve hand grasp), which can be obtained, for example, with suspension exercises. In general, all motor activities are useful to improve the muscular tone of shoulders and arms and therefore helpful to improve drawing, colouring, or writing performances. The children should hang on the bar as long as they can (without any constriction). This exercise improves the muscle tone of the shoulders considerably so that shoulders, arms and hands also become more resistant while writing. We have in fact noticed a significant correlation between this exercise and the increasing resistance of children in writing activities (Figure 2).

Figure 2.
Exercise to improve muscle tone of the shoulders.

4.4. Hand (haptic sensation)

Hands, as we know, are a fundamental tool for exploration and knowledge. However, some children find it problematic to use hands for exploring, touching, etc. (this is more evident in case of autism and other genetic syndromes). Helping children to improve the use of their hands as tools for exploring, touching, playing etc. is also essential to improve their handwriting skills. Useful games can be, for example, tactile boxes with materials of different consistency, such as rice, flour, maize, little stones, etc. In these boxes you can hide very motivating objects such as cars, toys and plastic animals. We have noticed that with a regular exercise (changing the kind and the amount of objects to look for), children

develop the ability to concentrate on the task. Searching and digging with hands, helps children to improve the use of their hands, and in particular of their haptic sensation. Touching alternatively light and heavy objects induces the organization of good hand tactility and it is also very important to promote an intelligent use of the hands. For example, children can be taught to recognize objects inside a bag or box, without seeing them. Both activities help children to obtain a superficial and deep level of haptic sensation, which is useful for developing a correct perception of the graphic tool. Improving tactility allows and facilitates the improvement of manual skills (Sangalli, 2009).

4.5. Visual convergence and accommodation

Our observations stress that some of the difficulties children encountered in colouring or drawing were clearly due to problems related to visual convergence. It is obvious that if children lack visual convergence, they find it difficult to focus on the working table or generally on what the hand is doing, and they cannot shift their attention from what they are doing to what the teacher is explaining. Children need to be able to listen and, at the same time, to perform actions. However, this depends on a specific neurofunctional organization of the brain area responsible for visual and auditory information. Our observations have allowed us to verify that stimulating the vestibular system (for example: by rolling) improves the children's visual and auditory coordination as well as the ability to concentrate on one's task. The vestibular stimulation deriving from rolling improves the visual convergence and its accommodation, activates the superior colliculus and enables the children to develop and maintain visual, motor and auditory concentration at the same time (Berthoz, 1998).

4.6. Brain dominance

According to our research and experience the establishment of lateralization is very important for improving handwriting skills. It is undeniable that many children have problems in establishing which side of the brain is dominant and these also have difficulties with handwriting. We have also seen that simple motor exercises (sliding, rolling, racing) are helpful to speed up the establishment of dominance. If carried out for at least one month, they gradually improve the ability of discriminatory using the contralateral hemi-body.

4.7. Running with contralateral gait pattern

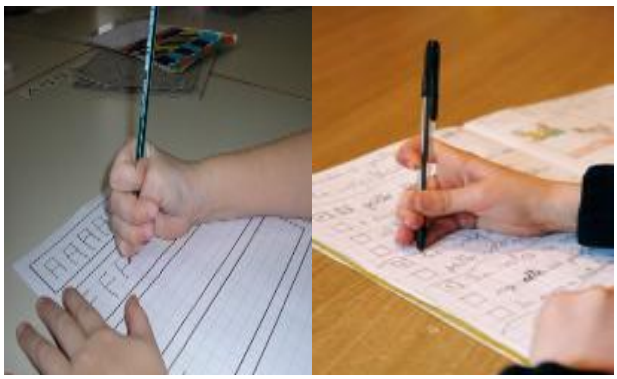
Children who are able to run with contralateral gait pattern have reached an important stage in their neuromotor development. They usually learn to walk and run in a coordinated way in the first three years and, during this phase, even their hands reach a fully neuromotor maturation. Our experience in the field showed us that children start to use hands properly after they have acquired the ability to independently use arms in a coordinated way when walking and running. Moreover, we have noticed that the contralateral gait pattern can be improved by playing on the ground: in particular with creeping activities (Figure 3).

Figure 3.
The game of crawling on the floor.

4.8. Correct hand grasp

There is a correlation between dysgraphia and wrong hand grasp (in figure 4 you can see two examples of wrong/dysfunctional hand grasp). That's why it is always better to react when children hold their writing tool in the wrong way. The best moment for intervening, if necessary, is usually at the age of three. There are some very easy and not invasive tips to favour a correct hand grasp.

Figure 4.
Two examples of dysfunctional grip.



For example, when children grasp the pen like a hammer and keep a very rigid wrist, a little plank of wood can be useful (Figure 5). Once the children have learnt to maintain a secure hold on the pen with their whole hand, it can be effective to make use of a small piece of cardboard taped along the pen (Figure 6) or a sock with two holes (Figure 7), in order to teach them to use thumb and forefinger properly. These are just simple solutions to correct hand grasp without great effort. Improving hand grasp is also possible if children are already able to write. In this case one has to keep in mind, that intervention has to rebuild the child's motor memory. The correction of hand grasp should not, therefore, take

place with the aid of writing exercises but with different exercises such as colouring (for children it is easier to train the correct hand grasp while colouring rather than while writing).

We have already said that asking children to correct hand grasp while writing is not the right way to intervene. By colouring, on the other hand, children are able to pay attention both on the task and on the correct grasp. The correct hand grasp becomes gradually familiar while colouring and children acquire a motor automatism in the most natural way. At this point they can also extend what they have acquired by colouring to handwriting.

Figure 5.
Felt pen with table.

Figure 6.
Pen with paper support.

Figure 7.
Sock with two holes.

4.9. Hand-eye coordination

Hand-eye coordination is achieved through specific motor activities like creeping, crawling and rolling. Thanks to the motor pattern that they activate, creeping and crawling in particular favour hand-eye coordination. On the other hand, rolling stimulates eye convergence, which is fundamental to reach and consolidate hand-eye coordination (Sangalli, 2009).

4.10. Mark control by colouring (3 different typologies), wrist control, wrist pressure, and finger motility

The movements necessary to complete handwriting tasks reach maturation through three different stages which are described here with the aid of colouring tasks.

Figure 8 shows the first colouring task. It is a stencil with a black card. Children are asked to colour every white space. This exercise helps them to develop the control of the colouring mark. The size of the image that they have to colour must be very small at first and can gradually increase along with the children's improvement. We have seen that using thicker and glossy paperboard for colouring tasks is useful when children tend to make holes in the sheet. It seems that they unlearn to press too much with the marker.

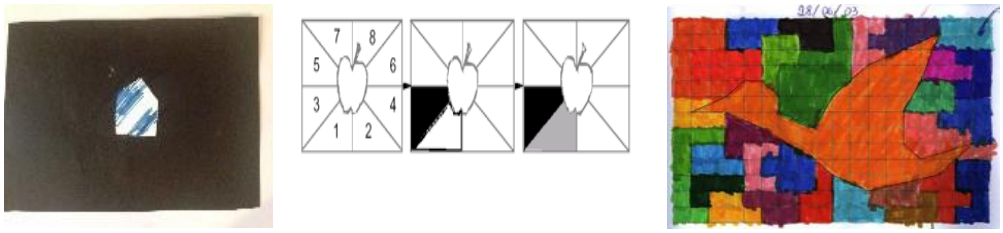
Figure 8 shows the second colouring task. Children have to colour different images, but one section at a time. It is the adult's task to outline which section the children have to colour. With this exercise children improve wrist control and increase wrist mobilization.

In figure 8 we see the last colouring task called 'Tetris'. When children master this task, they are actually ready for handwriting. This fine motor task of colouring activates all neuronal areas of the arms and the hand, which are involved in handwriting. Children learn how to turn their wrist and use it independently in order to colour all Tetris parts of the drawing and they also acquire all fine motor movements of their fingers. This task is also useful for left-handed children. They usually write covering the words they have just written while right-handed children can write and then control what they have written. With this type of colouring task and especially when they colour horizontal marks, left-handed

children learn to turn their wrist, which is what they are supposed to do when they write in order to control the letters they have just written.

In order to obtain a better finger motility (if it is necessary to intervene in this sense) colouring 0,5 cm large Tetris squares with wood crayon seems to be very useful.

Figure 8.
Examples of coloring exercises.

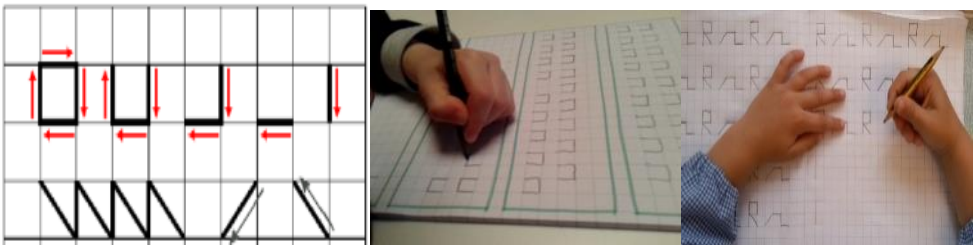


4.11. Spatial organization of the worksheet, squares and lines

The following figures show some prewriting exercises, which should teach children how to specially organize the tracing in the worksheet with respect to squares and lines.

You need a lot of colouring practice on one centimetre squared sheets. First of all, it is necessary to work with geometric shapes (like squares) representing letter patterns: colouring squares can be helpful at this stage. Then children also have to be trained in writing procedures, in particular the writing direction and orientation, by drawing the vertical and horizontal lines of squares, for example. These exercises represent the basis for learning how to write letters (Figure 9). The same procedure must be done for each letter and repeated several times. From a psychomotor and cognitive point of view, there is a strict connection between central cognitive systems (that govern the shape of letters) and the motor pattern of the hand (Sangalli, 2009).

Figure 9.
Examples of exercises to learn the direction and orientation of writing.

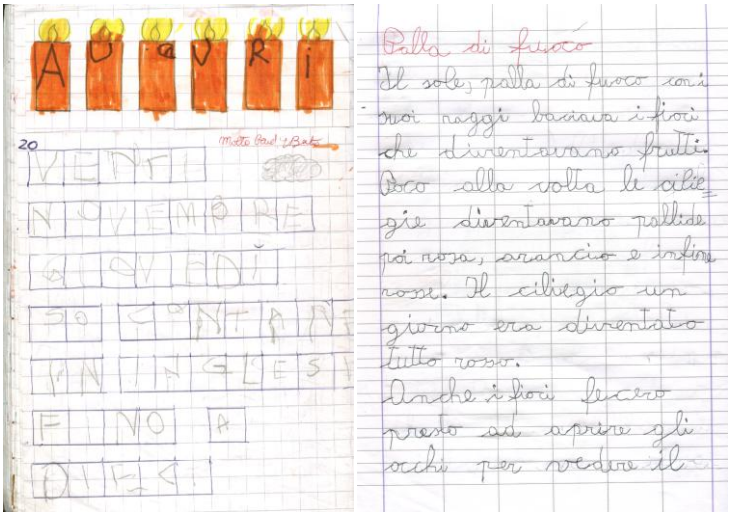


5. CONCLUSIONS

The educational interventions and the didactic solutions that we have applied to solve the problematics of writing have proved to be efficient, since there has been improvement in the writing ability of all the children with whom they have been put into effect (as an example, in figure 10, we show the comparison between a test written by a child before our intervention and another test written by the same child after our intervention). The

improvements we observed following our interventions were numerous. For example, there was improvement in the quality of the writing, the legibility of the written text, the organization of space on the page, the ability to write keeping the letters on a straight line or writing numbers in the small squares, etc. The general psychological approach of the children towards writing and learning has also been improved: The diminishing of the writing difficulties with the increase in the quality of the written product have generated a greater interest in the use of such a means of expression, increasing the levels of motivation towards the use of the written form. The observations that we have so far collected will be studied in depth by us in the course of further research, also with a view to define even more analytically the efficiency of the practices we have described. At the moment, for example, we are endeavouring to understand whether, by intervening at an early age on the prerequisites of the ability to write (which we pointed out and described in paragraph 3 of this article) through specific actions of educational support, it is possible to reduce the incidence of dysgraphia disorder in primary schools. To answer this question, we have chosen a sample of 100 children attending the primary school, with whom, during pre-school, we put into effect an educational action of prevention on the prerequisites of writing ability as defined by us. The data that is emerging from the research is reassuring. That which can be hypothesized is that intervening precociously on writing prerequisites not only counteracts the problematic of learning to write to the exclusive advantage of children at risk of dysgraphia (already per se, an important result) but rather an overall increase in learning ability of all the children is obtained and the levels of educational inclusion of every child are improved.

Figure 10.
Comparison between a test written by a child before our intervention and another test written by the same child after our intervention.



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Chapter #16

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, 1999). The purpose was to examine the extent of critical thinking cues that participants utilized when reflecting, in writing, on a controversial problem that they could encounter in their practice after having received extensive instruction on various constitutive elements of critical thinking. These cues manifested by students helped inform on the effectiveness of the instructional approach utilized in the course. The results indicated that the majority of participants were able to propose new and innovative ideas, reflect and 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. 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.

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 (Kpazaï, 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 extent to which critical thinking cues were expressed by students during data collection,

subsequent to their learning about critical thinking, using Garrison et al. (1999) Practical Inquiry Model (PI). This information will help to inform instructional approaches 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

Merriam-Webster dictionary (n.d.) defines the term "critical" as follows: exercising or involving careful judgment or judicious evaluation. As modern society faces a number of challenges, including addressing societal priorities such as the preservation of natural resources, ensuring economic stability, provision of satisfactory health care and education, amongst many others, it is of primary importance to nurture thinking structures that allow for a profound and critical reflection on societal issues. The importance of teaching students to think critically has been, in fact, widely accepted by researchers over the last several decades (Kpazaï, 2015; Kurfiss, 1988; McPeck, 2016; Williams, 2005). The intricacies that arise in daily life, the contemporary challenges that are faced, require rational and critical thought to navigate. Developing and nurturing critical thinking is therefore perceived as a notable and important priority in most higher education settings. 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 (Brookfield, 2012; Grosser & Lombard, 2008; Nelson, Palonsky, & McCarthy, 2017; 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 this concept, and that some of its definitional elements are contradictory in the scientific literature. He identifies critical thinking as an educational priority and as a transversal and transdisciplinary ability. In this explanation, Kpazaï (2015) evokes four definitions of critical thinking widely recognized in educational contexts, namely those of Ennis (1993), of McPeck (1981), of Paul (1992) and of Siegel (1988). These researchers consider critical thinking to be rational thought relevant to areas of study and that is determined by norms of thinking in the learner. 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.

Other researchers have interpreted critical thinking to be a process of reflection that allows for the disruption of a phenomenon by questioning what is typical and expected and by adopting a position, which is grounded in the reflective process. This perception of critical thinking is supported by researchers such as Bourque, Prévost and Lang (2013) and Chan (2013), who propose that critical thinking requires the creation of uncertainty to allow a more rigorous study of knowledge. Similarly, Bowell and Kemp (2015) suggest that critical thinking allows individuals to recognize the foundations of their knowledge and beliefs by analyzing them in depth. In short, even though the scientific community proposes a range of theories of critical thinking, researchers widely agree of the importance of developing it in educational environments (Kpazaï, 2015; Ku, 2009; Nelson et al., 2017; Williams, 2005).

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 Newman 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 practices.

2.2. Critical thinking models

In light of the growing perceived importance of nurturing critical thinking skills in students, numerous researchers have proposed strategies to measure critical reasoning, to conceptualize it into a model or framework (Erickson, Lanning & French, 2017; Kuhn, 1999). In the current study, numerous models were analyzed prior to retaining the PI Model. One example utilized in adolescent and adult learners is the Reflective Judgement Model (RJM) developed by King and Kitchener (1994). These authors conclude that reflective judgement is an aspect of critical thinking that is often neglected in the scientific literature. The model consists of seven stages of reflective judgement, in which the early stages represent passively receiving and accepting knowledge at face-value, to later stages where knowledge is processed through a series of cognitive procedures and reflections, where conclusions are founded on probabilistic factors. It should be noted that the RJM is pertinent to the current study in the sense that it is geared towards adolescent and adult learners faced with problematic situations. For the purposes of the current study, however, it was concluded that problems posed in reflective judgement may fluctuate from those posed while evaluating critical thinking. King and Kitchener (1994) specify that evaluations of reflective judgement are based on epistemic assumptions, whereas critical thinking problems are treated through inductive and deductive reasoning, through a process of inquiry, as was the intent in the current study.

Another model that was considered is the model of Kuhn (1999), who specializes in cognitive development. In her words, her critical thinking framework is grounded in contemporary empirical research on human development ranging from early childhood to adulthood. Contrary to some other critical thinking frameworks, however, Kuhn considers that the intellectual competencies required for critical thinking are metacognitive rather than cognitive. Moreover, the study of metacognitive skills to develop critical thinking has been broached by other researchers, yet few have unequivocally linked this to critical

thinking. One example is Magno (2010) a researcher who has studied the role of metacognition in critical thinking, and supports Kuhn's position in his hypothesis that critical thinking occurs when individuals utilize metacognitive processes. Kuhn's (1999) model combines metacognitive, metastrategic, and epistemological processes that encompass a vital part of necessary cognitive developments to achieve critical thinking. She also proposes levels of epistemological understanding from different ranges of assertions that in turn require varying levels of critical thinking to achieve. While it was pertinent to consider developmental constituents in the nurturing of critical thinking skills in students, Kuhn's model was considered to be a means to enrich the empirical and scientific data utilized as a basis for the study, which is highly relevant yet did not necessarily correspond with the purposes of the current study, as the objective was to assess the outcome of a critical thinking process in teacher education students.

Ultimately, the Practical Inquiry Model (PI) (Garrison et al., 2000) was retained for experimentation in the current study. The PI and the rationale for its selection is further explained in the section below.

2.3. 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 and is based on a component of the *Community of Inquiry* (COI) Model initially proposed by Garrison (1991). 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 reprised 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 phases constitute 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 twelve 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. Some of these sessions included theoretical presentations of various critical thinking definitions, as well as practical applications of instructional strategies meant to develop critical thinking following the *Guided Comprehension Direct Instruction Framework* developed by McLaughlin & DeVoogd (2004). The framework includes the following steps to presenting a critical instructional strategy: Explain the strategy (what it is, how it works), Demonstrate the strategy (using a think-aloud or visual support), Guide the students (in small-groups, guide them while they are applying the strategy), Practice the strategy (by having students work independently or with a partner/group) and Reflect on the strategy (reflect on how the strategy can help to develop critical thinking). Several strategies were taught to students using the framework as a basis, such as the Alternative Perspectives strategy, which has students reflect on a text or issue by adapting a different or unexpected viewpoint, and the *Problem-Posing* strategy, which requires students to engage in critical analysis of a video, text, discourse or controversial issue (McLaughlin & DeVoogd, 2004). 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 reacted critically to numerous texts and publicities of current events. Following the twelve sessions, 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.

Participants were then given classroom time (approximately 60 minutes) to reflect on the problem and attempt 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. (1996).

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		
	Mean:		**0,28**

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, a 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 "alternative rides should be provided" or "I would get the school to provide transportation for the children". Some transcriptions indicate that all ideas proposed in the Exploration phase are appropriate, without critically sorting the information to find an optimal or deeper solution to the issue "All issues I have presented I find relevant". In other instances, ideas were considered to be surface ideas where they proposed a solution that was already addressed in the problem. For example, a few participants noted that parents should be responsible for their children's' transportation: "parents should drive their own children to practices", "parents could drive their children instead", and "I would suggest that if parents aren't comfortable with the idea that they could go with the kids and drive the kids themselves". Another participant notes that "the school could provide more transportation to their students", and another "The responses/actions that would result in a more positive outcome would be for the school to organize a bus for the students to travel to their sports events". Given the fact that the problem stated that the school had limited resources to arrange transportation, responses that suggested that the school or parents arrange transportation without providing tangible solutions were considered to be surface ideas that did not delve into critical thought. As such, these types of responses were judged by the coders to be devoid of critical reflection, and were characterized as surface ideas.

4.2. Deep ideas

The majority of participants, nonetheless, explored numerous resolutions from a variety of standpoints, which demonstrated that they were able to consider multiple and conflicting stances when forming an opinion or proposing a solution to the problem posed. For example, some viewpoints presented conflicted with each other, such as: "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 and that teachers are required to adhere to the ethical standards of the *Ontario College of Teachers: "*Parents could be concerned as it puts their children in a vulnerable position" and "The negative consequences for the teacher are accusations of favoritism and potential accusations of unprofessionalism". 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. In sum, participant written responses that raised new and pertinent information and viewpoints were considered to be deep-level ideas.

5. CONCLUSION/DISCUSSION

In an experimentation similar to the one conducted in the current study, Garrison et al. (2000; 2010) observed that students rarely achieved the integration and resolution phases. Kuhn (1999) supports this finding in her assertion that one of the more common challenges in teaching critical thinking is that the knowledge gained is rarely generalized beyond the educational context. For the current study, data was collected at a time during which students has been extensively immersed in critical thinking education. The course professor had created an environment in which students were exposed to theoretical and practical critical thinking notions, and in which they were constantly encouraged to share multiple and varied viewpoints. Students also learned about the different stages of critical thinking in the PI model. Williams (2005) notes that the proclivity for participating in various critically engaging activities, in which the status quo is explored and challenged, represents a disposition for critical thinking. The context that was created in the classroom for the current study, which involved an infusion of critical thinking in educational activities is therefore one that characterizes students being engaged in an environment that nurtures critical thinking. This suggests that they would have been more likely to exhibit critical thinking due to being completely immersed in their educational context for a long period of time. Given the fact that the majority of participants manifested profound critical thinking skills in the current study, and based on the assumption that it could be in large part due to having learned extensively about critical thinking, it would be interesting to examine whether they would have been able to continue to apply their gained knowledge in their future professional contexts. It would also have been interesting to study whether groups of participants not exposed to extensive critical thinking instruction would have been able to think critically when faced with a similar fictional scenario. For the purposes of the current study, however, it is reasonable to conclude that the instructional strategies employed in the course helped students think critically, for the reasons mentioned above. Furthermore, as stated by Williams (2005): "Unless teacher education students become skilled in discussing seminal issues in society, they are unlikely to model and teach those skills to their students" (p. 182). It is noteworthy to mention, however, that engaging in critical thinking activities during student teacher education training is not sufficient to address all societal issues that exist in modern society, yet could contribute to helping teacher training become relevant in the K-12 educational framework, which would, in turn, dispose future generations to engage in critical thought in their social and societal contributions.

Nonetheless, as reflected in this paper and numerous other critical thinking studies (ex., Erickson et al., 2017; Kpazaï, 2015; McPeck, 2016; Williams, 2005), it is important to create teaching and learning contexts that are conducive to developing critical thinking competencies, which will in turn allow students to function more effectively in democratic societies. 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. The results of the current study can help to frame an educational approach that helps students reorient their cognitive processes to consider multiple positions when faced with a contemporary issue or challenge. 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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Chapter #17

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 cores, 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 experimental group was taught chemistry using PBL whereas conventional teaching methods were applied in the control group. Results indicated that implementing the problem-based learning approach had improved students' achievement and attitude. This study recommends that teachers implement problem-based learning in teaching science concepts especially chemistry for middle school students.

Keywords: PBL, science education, Lebanon, achievement, attitude.

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; Roehrig & Luft, 2004).

In the latter approach, the teacher's opinion dominates and the students are only compelled to memorize and reproduce knowledge (Vlassi & Karaliota, 2013), because, according to Perkins (as cited in Lord, 1999), it it is believed that content recitation underscores content comprehension.

According to Angelo (as cited in Lord, 1999), science teachers spend more than 90% of time in a science class lecturing and reviewing the factual content of the lessons.

Believing they have learned the material, the students do not attempt to mold and fashion the new information onto their preconceived mental foundations. For most educators, "student regurgitation of teacher-delivered content has been the standard means of evaluating learning in pupils" (Lord, 1999, p. 23).

The Relevance of Science Education (ROSE, 2003) study, an international comparative and groundbreaking project involving 40 countries, aimed to shed light on affective factors of importance to the learning of science and technology. This study identified key barriers for students in understanding their science classes, namely the

curriculum, science classes being too theoretical, some students lacking the confidence to believe that they can succeed in their science classes, not enough room for debate and for addressing current issues and scientific breakthroughs, and so forth (Sjøberg & Schreiner, 2010).

The picture is even gloomier in the Arab World. A negligible percentage (1%) of Arab eigth graders reached the advanced international benchmark (IAEEA, 2011). In 2011, Lebanon ranked at the bottom among all Arab countries (10 out of 11) in science achievement, (IAEEA, 2011). 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 (Nashwan, 1993).

All of the above challenges call for more innovative strategies for teaching science that would help improve students' engagement in the learning process (Osborne & Dillon, 2008). 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 (Akınoglu &Tandogan, 2007; Hmelo-Silver & Barrows, 2006; Savery, 2006;).

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).

PBL is a very useful pedagogical approach, with many valuable effects for the students. First of all, it promotes problem solving skills like cooperating, communicating, and researching skills. Students taught in PBL have greater ability than conventionally taught students to retain the knowledge they gain since they are actively engaged in the learning process (Wood, 2003). These PBL characteristics contribute to the increase in student motivation towards learning (Torp & Sage, 2002; Wood, 2003). Through PBL students become more skilled at gathering, organizing, and storing information in a useable form for future use, as well as, confronting and resolving complex, realistic problems. Active participation within the small group requires good interpersonal skills. These include: listening, giving and receiving criticism, compromising, negotiating, educating peers, and motivating others. You may be called upon to accept and work with fellow students of differing backgrounds and opinions. The teacher is a mentor that guides his student during their group work and helps them to find the knowledge needed to find the problem solution (Stepien et al, 1993; Wood, 2003).

The use of real life problem in the PBL strategy induces students' interest and thinking which leads to a greater student involvement in learning (Torp & Sage, 2002). Students gain the ability to analyze the problem and synthesize an appropriate explanation to it, which helps students become independent learners (Torp &Sage, 2002).

While the effectiveness of PBL has been documented by a number of studies (Colliver, 2000), its implementation may create some barriers, namely teacher's resistance to change their didactic teacher-centered style (Hmelo-Silver & Barrows, 2006), rigid scheduling and heavy curricula (Edwards & Hammer, 2004), cost of special materials and equipment, and space constraints (Torp & Sage, 2002).

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,Van der Vleuten & Norman, 2012), thus leading to improved achievement and attitude.

Studies on the effect of PBL on student attitude toward learning when compared to traditional teaching has generally yielded positive correlations (Demirel & Dağyar, 2016). For example, Üstün (as cited in Demirel & Dağyar, 2016) conducted a meta-analysis study to compare the effects of PBL and traditional teaching in terms of students' attitudes in science classes. Results showed that PBL had a medium effect on students' attitudes toward science classes when compared to traditional teaching (in Demirel & Dağyar, 2016). Ferreira and Trudel (2012) found that PBL use in three regular high school chemistry classes resulted in a significant improvement in student attitudes towards science, problem-solving skills and positive views of the learning environment, coupled with the fostering of a sense of community in the classroom. Yet, as advocated by Demirel and Dağyar (2016) more studies are needed to investigate the effect of PBL on student attitude on young students who use PBL outside of the school and who can solve real life problems.

3. RESEARCH QUESTIONS

The Lebanese educational system is known to be rigorous and demanding and adequately prepares graduates for college studies both in Lebanon and abroad, yet it fails to promote metacognition, application of knowledge in real-life situations, team work, communication skills, self-reflection, and so forth. PBL seems to be a synthesis of the aforementioned skills that is rarely found in other inquiry-based approaches.

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 addresses 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?

Although active and learning and constructivist approaches have long shown their effectiveness in Western educational contexts, their effectiveness on conforming Lebanese teenage students schooled for years in the traditional teacher-centered approach cannot be readily foreseen, thus the need for this study and its potential contribution to the field.

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, 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 from similar socioeconomic backgrounds, and were exposed to the same curriculum. They were divided into two equivalent groups: an experimental group that consisted of a convenient sample of 60 students (33 males and 27 females), and a control group of 60 (31 males and 29 females) who comprise four sections of Grade 7. Students were kept in their original sections. The investigator assigned students of the same grade level into homogeneous sections with respect to gender, grade-point average, and highest and lowest grades, to ensure a normal distribution in each class. The same sections were kept for research purposes. Students' grades as well as the achievement test before the treatment were used as covariates to adjust for differences between the experimental and the control group. The experimental group students were not previously exposed to the PBL method.

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 test and an attitude questionnaire. A pre and post testing control group design was used to compare students' achievement and attitude before and after the intervention. A pre-test including questions prepared by the researcher to the 7th graders was given to both research and control groups. A 30-item pilot multiple-choice questions test, developed by the researchers and based on students' book, was administered to both groups. The thinking levels of the test items varied from knowledge to synthesis according to Bloom's taxonomy. Content validity was established by 3 chemistry school teachers (2 for middle and one for secondary classes) and one university instructor. The academic achievement test was prepared in accordance with the aims and acquisitions in the chapter "Mixtures and Separation Techniques" in the chemistry national textbook. Based on the data, 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. Based on

the analyses, the final test consisted of 25 items and the reliability constant was high at 0.74. After conducting the test, the general difficulty level was computed (0.53). The total number of points was 100; 4 for each correct answer. The grade distribution was 5 for comprehension, 15 for analysis and application and 5 for synthesis questions.

The questionnaire designed to measure perceptions and attitudes towards the PBL method of instruction in chemistry was adapted from the instruments prepared by Siegel and Ramney (2003) and Khoiny (1995). It consisted of 16 items on a 5-point Likert scale. For each of the 16 items, the students were asked to indicate from 1 (strongly disagree) to 5 (strongly agree). The questionnaire consists of three types of statements representing belief (I think), behavior (I use), and affect (I enjoy….). The 16 statements were distributed as 6 belief statements, 5 affect statements and 5 behavior statements. The validity and reliability of the instrument have been justified in Khoiny's work. The Cronbach alpha coefficient for reliability was very high at 0.96. To analyze the questionnaire concerning the attitude of students towards the PBL approach use in chemistry, students' responses frequency was presented as an indicator. A bar graph was used to show the distribution of student answers for each of the questions presented in the questionnaire.

4.4. Data collection

The subject of chemistry is taught to grade 7 students for 2 periods weekly. The traditional teaching lesson for the theme separation techniques of mixtures requires 6 teaching periods. In parallel, two different sections were taught the same content but one with the PBL approach and the second control group with the traditional approach. For the PBL approach, core concepts were selected based on the Lebanese curriculum. The main investigator taught both the control and experimental groups. While aware of the potential threat of the experimenter's bias, the investigator resorted to a professor and research mentor who oversaw the planning and implementation of the study to make sure that objectivity is maintained to the best extent possible.

The PBL cycle was a real like problem presented to students. The unit separation mixtures started with daily life application of mixtures (drinking water: how does it reach our homesand what techniques are used to purify it). This activity was like a brain storm for students to motivate them and put them in the context the study. Students in the PBL class were divided into groups of 4 according to their performance levels and learning styles. Students were assigned tasks to suggest and perform an experimental procedure to purify a given sample of water (200 ml) with the minimum losses. Through group discussions, and during one session, students were encouraged to formulate hypotheses based on the type of pollutants they expect to find. This was followed by an individual reflection at home where students were expected to do a self- directed learning and present in the second session each in his group one possible hypothesis they think it is the most probable for pollutants. After agreeing on the hypothesis, students were asked to activate their prior knowledge and experience relative to the problem and start making their research to write the procedure for the separation technique to be performed and assigning tasks for each member in the group.

In the third session, the only concept that students did not learn on their own was fractional distillation as it was perceived as difficult. The teacher explained it to the students during a half a hour lecture and asked the students 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 (Table 1).

Table 1.
T-Test Analysis by Subject - Pre-tests results.

Comprehension	GROUP	N	MEAN	SS	T Test (Pre Test Results)
	Experimental Group (Pre)	60	15.87	1.798932515	0.35
	Control Group (Pre)	60	16.14	1.948489202	
Analysis	GROUP	N	MEAN	SS	T Test (Pre Test Results)
	Experimental Group (Pre)	60	49.87	4.196312613	0.47
	Control Group (Pre)	60	49.90	5.382961191	
Synthesis	GROUP	N	MEAN	SS	T Test (Pre Test Results)
	Experimental Group (Pre)	60	11.47	2.801129716	0.35
	Control Group (Pre)	60	11.73	2.972567609	

-Achievement of experimental group on the post-test was significantly better than that of controls. Given no other interfering variables, this finding is in favor of the PBL intervention (Table 2), consistent with earlier findings by Hattingh and Killen (2003) and Hung, Jonassen, & Liu, R (2008) that the use of PBL is more effective in learning science than traditional methods which do not seem to develop higher-order thinking skills (Tarhan, Ayar Kayali, Ozturk Urek, & Acar, 2008; Yu, She & Lee, 2010).

Table 2.
T-Test Analysis by Subject - Post-tests results.

Comprehension	GROUP	N	MEAN	SS	T Test (Post Test Results)
	Experimental Group (Post)	60	19.07	1.706087472	0.00
	Control Group (Post)	60	16.27	2.313312004	
Analysis	GROUP	N	MEAN	SS	T Test (Post Test Results)
	Experimental Group (Post)	60	56.13	3.605394577	0.00
	Control Group (Post)	60	49.42	4.883270183	
Synthesis	GROUP	N	MEAN	SS	T Test (Post Test Results)
	Experimental Group (Post)	60	15.87	2.752297448	0.00
	Control Group (Post)	60	11.80	2.849125151	

-A significant difference was found between pre and post test results for the experimental group before and after applying PBL across all thinking skills (Table 3).

Table 3.
T-Test Analysis by Subject - Pre Vs. Post Test scores.

Comprehension	GROUP	N	MEAN	SS	T Test (Pre –Post Test Results)
	Experimental Group (Pre)	60	15.87	1.798932515	0.00
	Experimental Group (Post)	60	19.07	1.706087472	
Analysis	GROUP	N	MEAN	SS	T Test (Pre –Post Test Results)
	Experimental Group (Pre)	60	49.87	4.196312613	0.00
	Experimental Group (Post)	60	56.13	3.605394577	
Synthesis	GROUP	N	MEAN	SS	T Test (Pre –Post Test Results)
	Experimental Group (Pre)	60	11.47	2.801129716	0.00
	Experimental Group (Post)	60	15.87	2.752297448	

5.2. Students' attitudes

Analysis of the questionnaire concluded that 89% of pupils found that PBL helped them better understand separation techniques; 89% found that the lesson was meaningful; 73% claimed it was well organized;73% found it engaging; 85% reported that it allowed them to use their knowledge in solving problems; 81% believed that it encouraged interaction with other students; 77% enjoyed working in a group; 85% effectively used the material provided in this unit; 77% felt their opinions were valued; 81% observed that PBL took more time than conventional lecture based approach; 77% became more responsible for their learning when using PBL; and 65% would like to use PBL again.

The subjects'generally favorable attitudes are consisent 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).

Cronbach's alpha was determined to measure the intercorrelations among test items or the internal consistency estimate of reliability of test scores (Table 4).

Table 4.
Item-Total Statistics.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
q1	42.15	97.713	.845	.900	.955
q2	42.15	91.924	.917	.912	.952
q3	42.80	95.221	.809	.908	.956
q4	42.30	97.589	.770	.860	.957
q5	42.55	93.734	.902	.908	.953
q6	42.10	96.200	.809	.918	.956
q7	42.05	103.629	.557	.877	.962
q8	42.80	96.905	.690	.907	.959
q9	42.55	95.208	.750	.751	.958
q10	42.05	92.050	.884	.967	.953
q11	42.35	97.713	.845	.945	.955
q12	42.90	93.568	.823	.845	.951
q 13	41.90	91.824	.786	.912	.952
q 14	41.86	92.134	.793	.908	.948
q 15	42.03	91.935	.568	.837	.947
q 16	41.89	91.886	.690	.845	.945

6. CONCLUSION

This study comparing the PBL approach to the conventional learning revealed that the PBL approach resulted in favorable 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 instructional approaches that are student-centered must be adopted. PBL should be seriously considered the teaching approach of choice (BouJaoude, 2002; Colliver & Markwell, 2007; Gerber, Lankshear, Larsson, & Svensson 1995). Even the national curriculum could be overhauled to integrate inquiry-based or active learning approaches. For example, Ontario has revamped its science curriculum to integrate similar approaches (The Revised Ontario Science Curriculum, 2008). Lebanon could draw valuable lessons from its innovative educational approaches and tremendously benefit from its success stories. To that end, classroom and labs should be designed spacious enough to make room for effective interaction among students. Further, instructional materials and study guides should contain a variety of sample problems for busy teachers who may lack time or motivation to develop new materials for their classes (Boujaoude, 2002; Wood, 2003).

Given its relatively small size and the non-random and homogeneous nature of the research sample, findings of this study cannot be generalized to the larger population. Future studies are urged to implement PBL in a variety of urban and rural settings, with larger sample sizes and randomly selected students from different socio-economic backgrounds, age and grade levels, and academic subjects and languages of teaching.

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Chapter #18

LEARNING IN HOME LANGUAGE: PREFERENCES IN SOUTH AFRICA

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ABSTRACT
The aim of this study is to investigate children and parents' preferences of language of learning and teaching (LOLT) in Grades 1 – 3 (aged between six and eight years), in Foundation Phase. This study is a survey in which questionnaires and interviews were conducted to collect data from identified stakeholders. The sample consisted of fifty learners, forty parents, thirty school heads, hundred and fifty Foundation Phase teachers and twenty Early Childhood Development teachers. Respondents were purposively selected from metropolitan, township and rural schools in Motheo district in Free State province in South Africa. The findings were that learners and parents preferred English as the language of instruction at Foundation Phase. The implications of these findings are discussed.

Keywords: bilingualism, home language, monolingualism, perceptions, attitudes.

1. INTRODUCTION

In South Africa, parents are permitted to choose the language in which their children are to be educated (Government Gazzette, 2002); but here is a specific group 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).

Bilingual indigenous-English speaking children often have early verbal input in indigenous language; and English is introduced once they enter school and develops subsequently through English literacy instruction (Ndamba, 2008; Khosa, 2012). The language situation of these children is termed both "emergent bilingual" and English second language learners (EL2) as they first encounter a new language when they go to school and have limited oral proficiency in that language (Bialystok, Martin, & Viswanathan, 2005; Bachore, 2014), as opposed to other bilingual learners who have encountered both languages before scholastic instruction begins. Not much work has been done on parents and pupils' language preferences in a bilingual set up at the elementary level in South Africa. Hence, this study sought to investigate unexamined early childhood bilingual education issues in South Africa, where there is concern about poor performance by pupils in both L1 and L2 language arts.

1.1. Attitudes toward learning through Mother tongue

The success of a mother tongue instruction policy relied mostly on people's perception towards home language and English as First addition language. According to Khosa (2012), there are number of issues that play a significant role in influencing people's attitudes towards learning in mother tongue. The historical and political background was active in influencing mother tongue learning. The previous apartheid language policies adopted the use of Afrikaans/English from the first grade or only encouraged the use of an African language as a medium of instruction in the lower grades in the primary school. This scenario can be regarded as the explanation behind the negative perception on mother tongue learning.

According to Ndamba (2008) "attitudes can be created through functions that people perceive particular languages as performing" (p.45). His observation stems from the African context, where he regarded official and local languages as in direct conflict with each other. They are not complementing each other. In other words, English is regarded as better than other local languages in terms of its social, political and economic function. It is often associated with power and success (Ndamba, 2008; Rahman & Asmari, 2014).

1.1.1. Learner Attitudes

According to Ndamba (2008), Westermann (1940) in Ngara (1982) was among the first people to note that there was a danger in using European languages as a medium of instruction for African children, who even at primary school level, did not attach any importance to the mother tongue, which they were prepared to get rid of as quickly as possible.

In Zimbabwe, Ngara (1982) in Ndamba (2008) observed that students had negative attitudes towards African languages. This was evidenced by the way the University of Rhodesia students in the 60s used to regard an English Honours degree as prestigious whereas a degree in Shona had a low reputation. Ngara (1982) goes further to say that even white government officials were aware that Africans had negative attitudes towards their own language. Rwambiwa's (1996) findings confirmed that pupils often humiliated teachers of African languages by expressing their (pupil) negative attitudes towards learning indigenous languages. He argues that such attitudes, expressed by students towards the mother tongue, are encouraged by the language policy of 1987 which requires students to learn all subjects in English beginning in grade in grade four.

In Tanzania, where education in primary schools is conducted in Kiswahili, studies by Roy-Campbell (1996) show that students favour retention of English as a medium of instruction at secondary level. Roy-Campbell (1996) found that many Tanzanian students who said that English should be maintained as medium of instruction could hardly carry out a conversation in English with the researcher. Such sentiments expressed by students who could barely communicate in English can only be attributed to attitudes. Roy-Campbell (1996) goes on to say that students do not value their mother tongue; hence they would prefer to learn using a language that they do not comprehend even when given the option to use their own language in learning.

In South Africa, the situation is not different. The research conducted by Setati and Langa (2006), showed that South African learners were in favour of the use of English in learning Mathematics in high school. The participants in that research could not see the importance of indigenous languages.

In September 2009, former 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.

1.1.2. Parental and Community attitudes

Regarding the West Africa, Fyle (1976) in Ndamba (2008) says that during the colonial period community attitudes were developed when everything pertaining to Europeans was regarded as excellent and worthy of imitation, whereas all that which belonged to the local African community was considered to be inferior. People in the post-colonial countries still identify education with former colonial languages as evident in new South Africa and Namibia, where Roy-Campbell (1996), Granville et al (1998), Setati (2005) observed that African still resist mother tongue education in favour of English which they view as a language of knowledge. Although children from non-English environments speaking backgrounds have potentially rich linguistic and cultural backgrounds, the communities do not indicate an awareness of such linguistic richness because of attitudes which range from ignorance or indifference to support and pride, and this somehow affects children's learning (Murray &Smith, 1988).

In South Africa, research carried out by Ngidi (2007) and Ndamba (2008) revealed that parents from schools of Mthunzi circuit (KwaZulu-Natal) had positive attitude towards the use of English as language of learning and teaching and as additional language in schools. Most of the parents from this Navilsig Combined School regarded African languages as of no use to their children. They cited employability and international communication exposure as their main concern. The learners also supported their parents by saying that English in an international language. It became ironic in the sense that organisations like PANSALB and the commission for the Promotion and Protection of the Rights of Cultural, Religious and Linguistic Communities were busy advocating the importance of mother tongue learning. All South African language policies were endorsing the freedom to learn in Home language from Grade R- 3 in Foundation Phase (Early Childhood Development) stream. Part of this study focused on learner's language preferences since these children are the direct beneficiaries of language policy which recognizes the significance of learning in the mother tongue in the lower grades. Parents' views were also sought to establish if there is consistency between language policy and parents' perception of the role of the mother tongue in teaching and learning.

The purpose of this study is to investigate the language preferences in South Africa. It wanted to establish learners and parents' perception and attitude on the use of mother tongue as a medium of instruction. Policies and a lot of research confirm the importance of Home language learning at initial education.

2. METHODOLOGY

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.

The sampling consisted of fifty (50) learners aged between six and eight years in grade 1 -3 (10 in grade 1 and 20 in both grade 2 and 3) and forty (40) parents with children in the Foundation Phase. Twenty (20) ECD teachers, thirty (30) principals and hundred and fifty (150) Foundation Phase teachers participated in the study.

2.1. Instruments

The instruments used in this study were both face to face interviews and a 14-item structured questionnaire. On the questionnaire, items one to twelve sought for the opinion of listening, speaking, writing and reading. It also looks at the issues of policy on mother tongue education in South African Foundation Phase Schools. Then, item thirteen and fourteen sought responses on the benefits of teaching and learning in mother tongue. The questionnaires were intended for the Grade 1 – 3 educators, primary school principals, EDC teachers. The interviews were conducted in African language since most of respondents were not proficient in English. The interviews allocated for parents were having closed and open-ended questions for a follow up inquiry from the researcher. The first question directed to them was basically on the awareness about the contents of the language policy on mother tongue education. And lastly on which language do they wish their children to be taught in. The Grade 1-3 learners had a well-structured interview to answer the question as to in which language would they prefer to be taught in. Since children were not able to answer the questionnaire, it was appropriate to use interviews for that purpose.

2.2. Procedure

The Free State Provincial Education Department in Motheo District directorate was consulted in terms of permission to conduct the study since this study involves participation of minor children. Letter of informed consent was also distributed to their parents to seek authorisation to interview their children. Educators played an important role in identifying learners to be interviewed. The parents interviewed were those who have children attending the same school.

Since this study involves participation of minor children, permission to conduct the study was sought from the Free State Provincial Education Department in the Motheo District directorate. Questionnaires were administered to school principals, ECDs and Foundation Phase teachers of 30 primary schools.

3. FINDINGS AND DISCUSSION

From the collected data, results show that from the language skills they were asked to answer, they prefer to write in English (i.e. 50% likes to write English, 40% in Sesotho and 10% in *Setswana*) from the chalkboard. They like to read English words (i.e. 40% in English, 30% in *Sesotho* and 30% in *Setswana*). But they like to communicate in *Sesotho/Setswana* because these languages are spoken at home. In most cases, 33% prefer to speak English, 50% speaks Sesotho and 16% speak *Setswana*. When coming to listening, they enjoy listening to their African languages (i.e. 50% in *Sesotho*, 33% in *Setswana* and 17% in English). Regardless of the data collected, learners still maintain that English is the preferred language of learning. On the other side parents maintain that their children should be taught in English (76% believe that English will prepare the future of their children at an early stage. Only 24% of parents showed appreciation of mother tongue education and feels strongly positive about it.

This study aimed at investigating perceptions of learners in Grade 1 – 3 in Foundation Phase education in Motheo district, Free State province in South Africa. The investigation was done on the basis of their choice between mother tongue and English. Their reading, writing, listening and speaking skills were assessed. The overall results showed that learners are in favour of English as a language of instruction. It became apparent that learners, even though they are in favour of English, were unable to communicate in English. They would prefer to communicate with their friends using their mother tongue. This was not surprising because they could naturally freely express themselves with their own indigenous language. The explanation for this might be the parental influence that English is associated with success and intelligence (Mofokeng, 2013; Khejeri, 2014). The negative attitude displayed by parents in relation to the use of home language, has a direct influence on their children's' attitude in learning with their mother tongue (Rahman & Asmari, 2014). Educators' attitude towards the use of mother tongue can be associated with learner attitudes. According to Khejeri (2014) 'mother tongue is disregarded for its lack of instrumental motivations while English is preferred for both its instrumental and integrative motivations" (p.81). At some point educators will undermine learners' home language and show some preferences in the use of English as a language of instruction. This inculcated a negative attitude towards their mother tongue (Khejeri, 2014; Tupas, 2015). The view of this was that if educators are not positive on the use of home language and they prefer English; it is highly possible that this will influence learners to disregard their mother tongue.

On the other hand, parents seem to lack knowledge about the policy of mother tongue education. That is to say, the process of language acquisition required the learner's active involvement. Meaning that for a child to be able to do well in learning the second language, he/she must first master and have a good command of his/her home language (Bhoi, 2014; Ganuza & Hedman, 2015). This in turn will promote bilingualism and multilingualism. The functional use of English is positively instilled in the mind of the learner for future use at an early stage without first taking the degree of language development into cognisance. This view is expressed by one of the participants in an interview.

"*Ha a ka pasa Sesotho, ha se na ho mo thusa ho fumana mosebetsi. Ngwana e nwa ha a na ho kenaYunivesithing ho ya ka molao a sa pasa English. Ke dumela hore ngwana wa ka a kgothalletswe ho ithuta English."* (If he/she passes Sesotho, it will not help him/her get a job. The child will not be admitted if he/she does not pass English. I believe that my child should be encouraged to learn English).

Another respondent put it thus, *"Ngwana o tla tswela pele a sa tsebe letho. Qetellong batla be ba sentse bokamoso ba ngwana ka ho phethahala."* (The child will proceed without knowing anything. Therefore his/her future will be futile.).

In this case, English is regarded as a future determiner. The main concern from the parents' response is employment and success. Parents negatively assess African languages because they are not highly rated (Robinson, 1996; Hart, 2008; Bachore, 2014). Another reason for positively rating English by parents was that African languages have been lowly rated by colonisers' policies before. So, there is no way that they can be revived to occupy top positions. They were also not classified as official language. Another issue was that National Certificate conditions in which were to be fulfilled, required that a learner should pass English in order to obtain Senior Certificate (i.e. Matric). In this case one of the respondents had to say this in the use of Sesotho/Setswana as language of learning in Foundation Phase, "*Ke re jwalo hobane ke tshimollo e mpe eo. Ha bana ba fihla ditlhahlobong tsa metriki ho tla be ho le thata ho bona, ho tla etsa hore ba pase dithuto tse ding empa e seng puo ya English*." (I say so because it will be difficult to pass English during matric examinations, but other subjects will be easy because they were long introduced to study them in English).

4. CONCLUSION

Bilingual education will continue to raise the most controversial and intriguing questions, therefore continuing to be a debatable topic among people involved with education. The suggestion we get from the findings is that parents and children had a more positive attitude towards English than the mother tongue as language of instruction at the Foundation Phase. This shows that people have been so linguistically colonized that they have more trust in the second language than they do in the first language process of children's learning. In short, participants in this study are in favour of English as language of learning because it is a key to success and employment. The attitude towards mother tongue learning is therefore negative.

5. RECOMMENDATIONS

This study recommends that policy makers should open a platform for a debate on mother tongue teaching so that other stakeholders can be aware about the importance of home language at early years of schooling. Parents should be sensitised on the importance of bilingualism and multilingualism in a given society. Parents and teachers need to be exposed to information concerning the value of using the mother tongue as a medium of instruction as these participants were unaware of the educational benefits of using the first language during the initial years of a child's schooling. Language organisations must try to come up with awareness campaigns on the importance of home language teaching.

We need to change parents and learners' attitudes for favouring English more than the first language. This should be done through campaigns to educate people on the rationale behind the use first language at Foundation Phase. This would assist in creating "a new generation of South Africans who are proud of their languages and their values, their cultures and their heritage" (Pan South African Language Board {PANSALB}, 2011). Currently PANSALB is making great strides to promote indigenous languages standards through sub-projects which involve making monolingual mother tongue dictionaries.

There is a need for further research on how to strengthen current policy implementation measures governing mother tongue in the Foundation Phase education in South Africa. There is a solution, even though 23 years after freedom, parents, teachers and learners still have negative attitudes towards learning in first language, despite benefits offered by mother tongue instruction.

Lastly, research is necessary concerning on how South Africa as a nation can take advantage of "additive bilingualism" rather than viewing as a "subtractive bilingualism" which undermines learning at the first language level. Hence, the scope of this study should also extend to how skills can be enhanced between the first language and the second language level, considering that some studies show how that the transfer is not automatic (Ndamba, 2008; Phindane, 2015).

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Chapter #19

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. If languages which are regarded as official according to the Constitution are used differently, this makes the different users of language to be disgruntled as their language is not recognised. In terms of Section 6 of the Constitution of the Republic of South Africa (1996) official languages are: Sepedi, Sesotho, Setswana, IsiSwati, Tshivenda, Xitsonga, Afrikaans, English, IsiNdebele, IsiXhosa and IsiZulu. The question which arises mostly is whether these (especially formerly marginalised) African languages are mastered by the children. The language of teaching and learning in most schools in South Africa is English. The chapter 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.

1. INTRODUCTION

South African Department of Education (1997) 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, IsiSwati, Tshivenda, Xitsonga, Afrikaans, English, IsiNdebele, IsiXhosa and IsiZulu. Whites and Blacks speak eleven languages mentioned above. All these languages are official in terms 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 3 they are supposed to be taught in their mother tongues (First Language). It should be remembered that the age of a child entering Grade 1 is age five turning six by 30 June in the year of admission. For Grade R which is the reception year, the age is four turning five by 30 June in the year of admission. In terms of Language Policy of 1997 all learners shall offer at least one approved language as a subject in Grade 1 to 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.

Children who have the opportunity to maintain their first language can extend their cognitive development, while learning first additional language. Their level of competence in the first additional language will be related to the level of competence they have achieved in their first language (Cummins, 1984) as quoted by (Clark, 2009). Children with a sound knowledge of their first language will be able to transfer skills from one language to another. Early childhood professionals can play a vital role in the maintenance of children's first languages. They can provide opportunities for children to use their first language in early childhood settings and at school and encourage parents to use the first language at home in order to provide a good foundation for learning first additional language.

4. IMPORTANCE OF LEARNING FIRST ADDITIONAL LANGUAGE

According to Lang (2009) and Frontiers 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**

If children are exposed to first additional language at an early age (as early as 3 years old) will result in much easier and better fluency than if they learn later in life. Between ages of 8 and 12, children lose the ability to hear and reproduce new sounds as they did when they were younger, making first additional language acquisition not impossible, but more difficult.

- **Cognitive Benefits**

When it comes to learning a new language, some of the biggest benefits for children are those associated with cognitive performance. Research has shown that language learning is more cognitive than linguistic. Following are some of the cognitive benefits to learning a first additional language:

The concept of “object permanence” develops at a younger age; better problem solving skills; better critical thinking skills; more creativity; better flexibility of mind; enhanced memory; and better multi-tasking abilities.

- **Enhanced Thinking Skills**

It is not only cognitive abilities where children who speak a first additional language seem to outperform others; this has also been known to make children more open minded with regards to how they view the world. The ability to think "outside of the box" is something that many professionals hold in high regard because this is related to more effective problem solving abilities. Those who speak more than one language do not simply develop this ability because of the processes that go into learning a new language. They also come into contact with a wider variety of individuals from different backgrounds. What is more, children who speak another language often have the ability to read in other languages, therefore exposing themselves to a wider range of literature.

- **Literacy Skills Enhanced**

One of the side effects of learning a new language, according to a university in Canada, is that it actually gives children an edge when it comes time to learn how to read in that language. Children are often able to apply what they have learned in one language to others, and this is apparent as they go about learning to sound out new words that they read in books, newspapers and blogs, among other resources. As children practice learning to read in a variety of languages, they will inevitably increase the rate at which they read comfortably, allowing them to improve their overall abilities in this field.

- **Higher Academic Achievement**

Along the same lines of the cognitive benefits mentioned above, learning a first additional language can also provide academic benefits. Bilingual children have been shown to have better critical thinking skills, problem solving skills, and greater mental flexibility. All these things result in better academic performance. Bilingual students have been shown to have higher math skills. Contrary to popular belief, not only does learning a first additional language not inhibit the child’s English language proficiency, it enhances and improves it.

- **Cultural Enrichment**

Parents want their children to be well-rounded, to have a love for learning and an appreciation for other cultures, and to grow up to be successful and contributing members of society. Learning a first additional language opens doors that would not otherwise be opened. Bilingual (or trilingual) individuals have access to resources, people, places, and things that the most people would not. Not only can a first additional language provide a competitive edge in the workforce, but it creates a deeper understanding of and appreciation for humanity and culture, which enriches one's life and personal experiences in the world.

- **Societal Contributions**

All parents want their children to change the world. They have high hopes and dreams for their children – not only for their own pride in them, but for the betterment of society and the world at large.

5. AIM OF THE PAPER

The paper investigated whether Foundation Phase learners are able to switch from mother tongue (first language) to second language (first additional language) without challenges.

6. 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.

7. DATA ANALYSIS, DISCUSSION AND FINDINGS

The following discussion is analyzing data and discussing the findings:

7.1. Section A - biographical information

Table 1.
Gender.

	Number of participants	**Percentages**
Male	6	60%
Female	4	40%
Total	**10**	**100%**

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, Alm, & Thornberg, 2014; Petersen, 2014; Mukuna & Mutsoso, 2011; Sumsion, 2005; Hofmeyr & Hall, 1996).

Table 2.
Teaching experience.

	Number of participants	Percentages
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%
Total	**10**	**100%**

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.

7.2. Section B

Table 3.
Class is composed of learners who come from multicultural backgrounds.

	Number of participants	Percentages
Strongly disagree	3	30%
Disagree	3	30%
Neutral	1	10%
Agree	2	20%
Strongly agree	1	10%
Total	**10**	**100%**

South Africa has eleven official languages which are English, Afrikaans, Sepedi, Sesotho, Setswana, IsiSwati, Tshivenda, Xitsonga, IsiNdebele, IsiXhosa and IsiZulu. It means that learners may come from eleven cultural backgrounds. Learners from different cultural backgrounds are allowed to school together by law. It is not surprising to find out that 30% of participants agree that they have learners who come from multicultural backgrounds. The fact that 60% of participants disagree that they teach learners from multicultural backgrounds is because Sibasa Circuit is predominantly dominated by one

culture. Surprisingly 10% of participants indicated that they are neutral. A study by Tosic (2012) on 'Multicultural education in one of the primary schools in Norway reveals broad contestation with regard to espoused benefits of multi-cultural teaching with vast number of participants being in favour of bilingual teaching and stronger forms of collaboration as benefits of bilingual education. This kind contestation is still deliberated in our education system and still remains empirically untested terrain. Alexander (2009) see interconnectedness of race, socio-economic factors, language, religion, learning styles and resources as the main contentious issues confronting teachers in their classes when dealing with multi-cultural issues. It is worth noting that all these issues are common and prevalent across all the former racially-based departments of education and teachers are not necessarily prepared or trained for such new roles (Alexander, 2009). Meier and Hartell (2009) cautioned that given the complexity of handling diversity in education as there is a need for educators or teachers to recognise the validity of differences. Meier and Hartell (2009) suggest that teachers' own personal and institutional ideologies and perceptions need to be reappraised and they must be a conviction and dedication to facilitate and manage learner diversity.

Table 4.
Learners understand their first language(s).

	Number of participants	**Percentages**
Strongly disagree	3	30%
Disagree	0	0%
Neutral	1	10%
Agree	3	30%
Strongly agree	3	30%
Total	**10**	**100%**

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 5.
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%
Total	**10**	**100%**

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. It is worth noting that one of the reasons why ISFPLs were enrolled in English medium schools is that their parents wanted them to speak English fluently (Govender, 2010).

Table 6.
They can write, read and count in first language.

	Number of participants	Percentages
Strongly disagree	0	0%
Disagree	0	0%
Neutral	2	20%
Agree	7	70%
Strongly agree	1	10%
Total	**10**	**100%**

According to Bernhardt and Kamil (1995) as cited by Jiang (2011) there are two main positions regarding the relationship between first language literacy and first additional language reading development: the *Linguistic Interdependence Hypothesis* and the *Linguistic Threshold Hypothesis*. According to the Linguistic Interdependence Hypothesis, first language literacy provides a good foundation for first additional language reading development. The hypothesis posits that fundamental similarities exist between first language and first additional language skills, and that they are interdependent. Specifically, reading performance in a first additional language is largely shared with reading ability in a first language. At least 80% of participants agree that their learners can read, write and count in the first language. This is advantage to learners as they have basic knowledge and understanding of reading, writing and counting in order for them to comprehend first additional language.

Table 7.
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%
Total	**10**	**100%**

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. Comprehension was viewed as the mastery of these skills (Texas Educational Agency, 2002).

In the field of reading, a number of cognitive scientists focused their attention on how readers construct meaning as they read. Specifically, they studied the mental activities that good readers engage in to achieve comprehension. From these studies an entirely new concept emerged about what reading is. Reading is a complex, active process of constructing meaning not skill application. Texas Educational Agency (2002) goes on to state that the act of constructing meaning is:

- Interactive: it involves not just the reader but also the text and the context in which reading takes place.
- Strategic: readers have purposes for their reading and use a variety of strategies and skills as they construct meaning.
- Adaptable: readers change the strategies they use as they read different kinds of text or as they read for different purposes.

While cognitive science research was producing valuable information about comprehension processes, reading education researchers were reporting important findings about what comprehension instruction looks like in the most effective reading classrooms. During reading, good readers read words accurately and quickly, and simultaneously deal with the meanings of those words as well as the meanings of the phrases and sentences into which the words are grouped. Good readers connect the meaning of one sentence to the meaning of another (Texas Educational Agency, 2002). In line with Texas Educational Agency states above it is not surprising to find out that 60% of participants agree that learners can comprehend what they have read in first additional language.

Table 8.
Switching to first additional language is easy.

	Number of participants	Percentages
Strongly disagree	3	30%
Disagree	3	30%
Neutral	1	10%
Agree	2	20%
Strongly agree	1	10%
Total	**10**	**100%**

At least 60% of participants disagree that switching to first additional language is easy. But 30% of participants agree that switching from first language to first additional language is not easy. Switching to first additional language might be not easy, but it has to be done. Lingholic (2016) is of the opinion that one might be wondering why anyone would go through the discomfort of trying to think in a foreign language, especially during the early stages or learning. Well, for starters, thinking in the language one is trying to learn is one of the easiest ways to review the vocabulary and grammatical patterns one has acquired. By actually forcing one's brain to think in a language it is not used to think in, one will also help activate the newly-acquired information by giving one's a real-life use for it.

These, in turn, will speed-up the passive-to-active vocabulary transition. In a nutshell, passive vocabulary includes the words stored in verbal memory that people partially "understand," but not well enough for active use. One's active vocabulary, on the other hand, includes the words that you can readily use when speaking and writing. Another great reason to practice thinking in a foreign language according to a study conducted by the University of Chicago psychologists, is how language affects reasoning, one will make decisions that will tend to be less biased, more analytic, and more systematic. Why is that? "Because," according to the study of Keysar, Hayakawa and An (2012) "a foreign language provides psychological distance." So by thinking in a foreign language one will not only be jump-starting one's skills in that language, but one will also make smarter decisions (Lingholic, 2016).

Table 9.
Switching to first additional language is a challenge to learners.

	Number of participants	Percentages
Strongly disagree	1	10%
Disagree	0	0%
Neutral	0	0%
Agree	6	60%
Strongly agree	3	30%
Total	**10**	**100%**

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**

English Grammar is complex, making it difficult to remember, master and use logically. Ensuring one uses the correct grammar can be tricky, especially when one is in conversation with someone and speaking at an alarmingly fast pace. Learning grammar is like learning to drive, one can learn all of the theory, rules and regulations, but one won't be good at it unless one practices it and it starts to become second nature to the one who is learning. Grammar is extremely important, incorrect use of grammar can confuse the person one is speaking to and even change the meaning of what one is communicating, what's more is native English speakers are hyper aware of grammar and will notice almost immediately if a grammatical error is made, even if this is the smallest of errors, English speakers are incredibly proud of the language and look negatively on it being used incorrectly.

- **Vocabulary**

It is often a challenge, particularly when it comes to verb variations and understanding which tense should be used in various situations. English has one of the biggest vocabularies of all languages, and it can be very confusing for non-English speakers to master. Using vocabulary inaccurately is incredibly noticeable to anyone whose first language is English, though it doesn't often change the meaning of the text, it does weaken it.

- **Slang and colloquialism**

With the English language having such an extensive vocabulary and complicated grammar, there is enough to teach students wanting to learn English, rarely are learners exposed to the slang words used by English speakers in every day conversation. Sentences can be predominantly filled with slang words, so maintaining a conversation can be difficult for anyone who doesn't understand what they mean.

- **Pronunciation**

Knowing how to pronounce words in English can be very difficult as it isn't always obvious. English speakers have been taught these from an early age, which is how they know not to pronounce the ‘k' on ‘knight’, they are taught the subtleties in how to pronounce something to communicate the right message. Furthermore, depending on the first language of the English student, it can often be difficult to pronounce certain words properly, having not ever had to create that phonetic sound before.

- **Variations in English**

The variations in the different forms of English can often be difficult to understand. For example, the difference between using formal and informal language or the differences between spoken and written language. This leads to students writing words phonetically, that is how they would say it rather than how it is actually spelt, and using informal language, maybe even slang that they have picked up, in formal situations which may perhaps be viewed negatively.

Table 10.
It is easy to switch to first additional language for learners who have mastered their first language.

	Number of participants	**Percentages**
Strongly disagree	1	10%
Disagree	0	0%
Neutral	0	0%
Agree	7	70%
Strongly agree	2	20%
Total	**10**	**100%**

At least 90 % of participants agree that it is easy to switch to first additional language for learners who have mastered their first language. Taylor and Coetzee (2013) noted that even though their findings point to the value of the mother tongue as the language of instruction, it is very important to strengthen the teaching of English as a subject in the early grades to help to facilitate the transition to English in grade four, as recommended by the curriculum and assessment policy statements (CAPS).

Table 11.
It is a challenge to switch to first additional language for learners who have not mastered their first language.

	Number of participants	**Percentages**
Strongly disagree	0	0%
Disagree	0	0%
Neutral	0	0%
Agree	5	50%
Strongly agree	5	50%
Total	**10**	**100%**

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. Cook (2013) also highlights that beside all the advocacy for the introduction of FAL when the children are six or seven years, some educational pundits claim that the vast number of black parents are realising entire economy is now organised on English terms and therefore the chances of success are much greater in the English as a language of instruction that need to be introduced as early in the children schooling as possible. This is seen to be a solution that would lessened the burden of poor mother tongue in the FP classes and the distressing conversion to English later on (Cook, 2013).

8. 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 where 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.

9. 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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