TOJET
The Turkish Online Journal of Educational Technology

ISSN 2146-7242

Turkish Online Journal of Educational Technology

Volume 16, Issue 2
April 2017

TOJET
01.04.2017

THE TURKISH ONLINE JOURNAL OF EDUCATIONAL TECHNOLOGY

April 2017
Volume 16 – Issue 2

ISSN: 2146 - 7242

Indexed by
Education Resources Information Center – **ERIC**
SCOPUS - ELSEVIER

Published in TURKEY

Contact Address:
Prof. Dr. Aytekin İŞMAN
TOJET, Editor in Chief
Sakarya-Turkey

Message from the Editor-in-Chief

Dear Colleagues,

I am happy to inform you that the Turkish Online Journal of Educational Technology (TOJET) has been published volume 16 issue 2 in 2017. This issue has research papers from all around the world.

The Turkish Online Journal of Educational Technology is an international journal in the field of educational technology. TOJET is an online and peer-reviewed journal that accepts papers on all aspects of educational technology. Research papers could be about, but are not limited to: using educational technology in classroom, new developments in educational technology, instructional design, distance education, computer and internet applications in education, educational simulations, educational gaming, and other aspects of the use of educational technology in the learning and teaching activities.

The aim of TOJET is to diffuse new developments in educational technology. The mission of TOJET is to provide educators, teachers, administrators, parents and faculties with knowledge about the very best research in educational technology. TOJET's acceptance rate is almost 35%. TOJET is now a major resource for knowledge about educational technology.

TOJET publishes research and scholarly papers in the fields of educational technology. All papers are reviewed at least by two international members of the Editorial Board with expertise in the areas(s) represented by a paper, and/or invited reviewers with special competence in the area(s) covered. The Editors reserve the right to make minor alterations to all papers that are accepted for publication.

TOJET is interested in various researches in educational technology. These researches can help teachers to find out how educational technology can motivate and help students to put the knowledge to their long term memory. Therefore, I am pleased to publish this issue which different papers from various fields are shared with professionals.

The guest editor of April, 2017 issue is Associate Professor Dr. Anita G. Welch from Teachers College, Educational Studies, Ball State University, USA. TOJET thanks and appreciate the guest editor and the editorial board members who have acted as reviewers for one or more submissions of this issue for their valuable contributions.
TOJET is confident that readers will learn and get different aspects on how to use educational technology in learning and teaching environments. Any views expressed in this publication are the views of the authors and are not the views of the Editor and TOJET.

TOJET will organize IETC-2017 at Harvard University in Boston, USA. IETC series is an international educational activity for academics, teachers and educators. This conference is now a well known educational technology event. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities. Its focus is to create and disseminate knowledge about the use of instructional technology for learning and teaching in education.

Call for Papers
TOJET invites our authors to submit a research paper. Submitted articles should be about all aspects of educational technology. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET. Manuscripts must be submitted in English.

TOJET is guided by its' editors, guest editors and advisory boards. If you are interested in contributing to TOJET as an author, guest editor or reviewer, please send your CV to tojet.editor@gmail.com.

April 01, 2017
Editors,
Prof. Dr. Aytekin İŞMAN
Sakarya University
Prof. Dr. Jerry WILLIS
Manhattanville College
Prof. Dr. J. Ana Donaldson
Former President of AECT

Editorial Board

Table of Contents

Analysis of University Management of Emerging Technologies and Recommendations for Developing Countries

Eliana María Villa Enciso
Departament of Management Sciences, Instituto Tecnológico Metropolitano (ITM), Medellín, Colombia elianavilla@itm.edu.co

Edgar Picón Jácome
School of Languages, Universidad de Antioquia (UdeA), Medellín-Colombia
edgar.picon@udea.edu.co

Alejandro Valencia-Arias
Departament of Management Sciences, Instituto Tecnológico Metropolitano (ITM), Medellín, Colombia
elianavilla@itm.edu.co

Claudia Nelcy Jiménez Hernández
Departament of Rural Development, Universidad Nacional de Colombia (UN), Bogotá, Colombia
cnjimenezh@unal.edu.co

ABSTRACT
University management seeks to achieve the objectives established by higher educations institutions, including their third mission, which corresponds to the transfer of research results into the industry; in this regard, emerging technologies play an important role to solve problems identified in the industry. Emerging technologies are those found in the embryonic stage of its life cycle. Although they have features that make them difficult to manage, they can quickly change the dynamics of the market. That is why it is necessary to analyze the management process of these technologies at the university level, due to, in many cases, it is in high education institutions where these technologies arise. This paper presents results of a study aiming at analyzing the process of university management of emerging technologies in a developing country, identifying gaps in such process in relation to referent countries, and proposing recommendations to reduce those gaps. The research methodology included benchmarking to identify best practices concerning referent universities and a case study in which a university research group in a developing country was analyzed. Results indicate that universities of developing countries acknowledge the importance of managing emerging technologies, which should lead to structural changes in the Systems of Science and Technology as well as in the higher educations institutions and in the management of the research groups that generate and use these technologies. However, the analysis identified some key success factors of referent universities to be either absent or acting defitienly in the focal case studied. Finally, some recommendations are proposed to reduce the identified gaps.

Keywords: university management, emerging technologies, benchmarking, case study, analysis, recommendations, developing countries.

INTRODUCTION
Higher Education Institutions (HEI) currently face the challenge of directly impact society with the knowledge they generate. In this sense, their third mission consits on a meaningful transfer of the results of the processes of Research and Development (R & D) to the industry, so that they become innovation to be accepted and implemented becoming real solutions to the problems that society presents (Gür, Oylumlu, & Kunday, 2016) . In order for this to happen, it is necessary for HEIs to generate suitable university management processes from within, that enable them to achieve the objectives of technology transfer that support innovation processes (Aceves, Siller, Torres, & Martinez, 2013; Bernardt, Meijaard, & Kerste, 2002; Borges & Jacques Filion, 2013; Cabrera & Soto, n.d.; Rip, 2011). Therefore, it is essential that appropriate management processes are developed regarding technologies that might emerge within research projects, as part of university management (Díez, Valencia & Villa, 2015) .

Given the above, high education institutions have the duty to support and monitor the generation, appropriation and/or adoption of technologies to solve the problems identified in the industry.These processes can give rise to emerging technologies, which are technologies in their initial phase with specific characteristics that differentiate its management (Day & Schoemaker, 2000). Some of those characteristics include lack of historical data that would allow to generate risk projections and analysis, uncertainty about whether the market would accept the technology, the ethical challenges that this new technology might bring, and lack of awareness both about the

existence of such market and the eventual use of these technologies; the foregoing features of emerging technologies imply for their management a high component of risk and uncertainty (Gavankar, Anderson, & Keller, 2014). However, emerging technologies are the ones that move the markets, making a challenge for high education institutions not only to identify them but also to develop and promote their use; ie, their proper management. Studies in the field (Bhattacherjee, 1998; Tegarden, Lamb, Hatfield, & Ji, 2012) have identified that high education institutions that manage emerging technologies in developed countries count on particular characteristics that permit them to be successful (Villa, 2015).

Unfortunately, the study of the management of these technologies in high education institutions of developing countries is just beginning (González Arango, Schmal Simon, Gonzalez Arango, & Schmal Simon, 2005; Llanos, 2004; Ortiz-Riaga & Morales-Rubiano, 2011); despite this fact, its importance to their technological development is recognized. Therefore, the objective of this research study was to analyze the university management of emerging technologies both at the international and local contexts in order to understand the state of the art in this field, and propose recommendations for improvement regarding this matter, to HEIs in developing countries. In order to meet this goal, this paper presents the study and its results in four sections as follows: Section two presents the conceptual background, which elaborates on the concepts involved in the study; section three explains the methodology used to conduct the research, which integrated a benchmarking to establish what universities are doing regarding emerging technology management in the international arena and a case study of a university that manages emerging technologies in a developing country; section four, findings and discussion, presents the analysis carried out in order to (1) identify the salient characteristics of emerging technology management in high education institutions in which these processes are successful and (2) establish the gaps regarding management of emerging technology at the university focus of the case study with respect to universities in countries with greater recognition and legacy; finally, section five presents recommendations for improvement aimed at closing the gaps in developing countries as well as suggestions for further research.

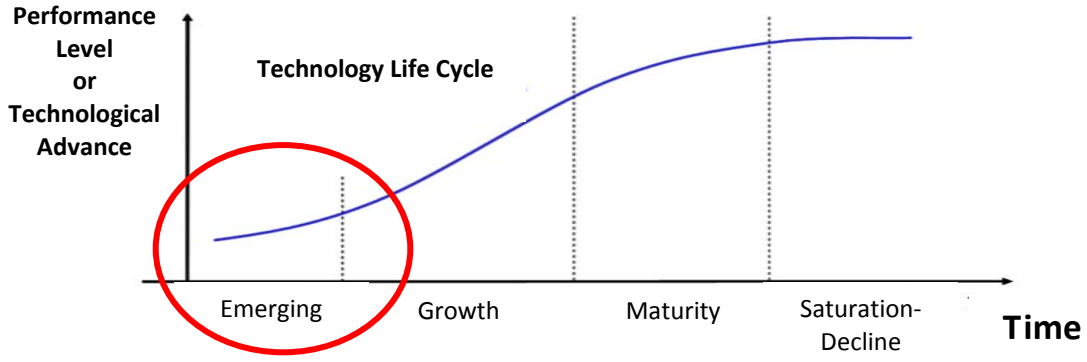
2. CONCEPTUAL BACKGROUND

This section presents the theoretical framework that supports the study. Consequently, it (1) introduces the conceptualization of emerging technologies and its relevance, and (2) describes the processes of university technology management highlighting the importance of identifying gaps in these processes in local contexts with respect to international examples.

2.1 Emerging Technologies

According to the state in which a technology is found in its life cycle, it has a number of special characteristics: the literature reports four basic states of technology (see Figure 1).

Figure 1: Identification of emerging technologies in the technology life cycle, S curve.



Emerging technologies are those found in the nascent stage of its life cycle. One of the important features to highlight about these technologies is that they represent an important opportunity for technological development despite they lack constituted markets and historical data; that is to say, they could become very important technologies within a short term (Atanu, Love, & Schwart, 1994; Day & Schoemaker, 2000; Halaweh, 2013; Khanagha, Volberda, Sidhu, & Oshri, 2013; E. Villa, 2015). However, standards and specifications of use for these technologies are either not developed or immature, they do not count on a pre-established or known business model to use them, and neither the rate of their adoption nor its price or cost can be determined. Additionally, these technologies have network effects; i.e. their value increases according to the increment in the number of users; the cost of an emerging technology is thus high and so is the cost of replacing a traditional technology for an emerging one. On the other hand, these technologies involve a number of both ethical and legal considerations, as well as environmental factors, which are unknown and unpredictable, and therefore

difficult to manage (Atanu et al., 1994; Day & Schoemaker, 2004; Frewer, 1999; Navas, Londoño, Ruiz, & Ruiz, 2012) However, they should not be ignored because they can create disruptive changes in society (Adner & Levinthal, 2002; Fleischer, Decker, & Fiedeler, 2005; Godwin-Jones, 2003; Hung & Chu, 2006; Newman et al., 2012).

Some emerging technologies for 2016 are Internet of Nano things, large-scale energy storage, block chains, 2D materials, autonomous vehicles, Organs-on-Chips, perovskite solar cells, open AI ecosystems, optogenetics, metabolic and immune system engineering, genome editing of plants, human machine interfaces, reusable rockets, robots with the ability to teach each other, Apps for DNA, SolarCity's gigafactory to end the use of fossil fuels, among others (Forum, 2016; Review, 2016). These emerging technologies will be part of the future of citizen science in terms of its research processes, program and participant cultures, and scientific communities.

2.2 University Technology Management (UTM)

University technology management (UTM) consists specifically on inventorying, monitoring, evaluating, enhancing, optimizing and securing technology in organizations (Gaynor, 1999; Jiménez, Castellanos, & Morales, 2007; Tapias G., 2000). In this sense, (Castrejón, Hernández, & Ruiz, 2014), argue that technological management developed in university research groups (UTM) is a triggering element for competitiveness, for which the various aspects within the UTM should be taken into account in innovation systems and should be supported holistically (time, resources, processes and proper management from all areas of the university) to strengthen and enhance their results (E. Villa, 2015).

University technology management is strengthened through the creation of the tie university-industry-society and, in addition, when higher education institutions (HEI) are focused on meeting their so-called "third mission", related to their direct role in economic development and their real impact on society (Arvanitis & Villavicencio, 1994; Friedman & Silberman, 2003; Howland, Good, & Robertson, 2007; E. Villa, Echeverry, & Jiménez, 2015). To achieve such a goal, a new model of entrepreneurial and research driven university emerges in the society of knowledge, bringing challenges as new as: a) impelling the development of society as a product of social and economic progress, which is achieved through the effective application of knowledge; and b) proving that higher education is essential to support the processes of creation, dissemination and appropriation of knowledge: the countries that disregard these challenges are at risk of being left behind in this new world order (Díez et al., 2015; Pineda, 2013). To attain this objective, universities rely on *technology management processes*, specifically from university research groups (Geisler, 1995; Mowery & Shane, 2002; Siegel, Waldman, & Link, 2003; Silva & Nuño, 2014).

As for the mechanisms used in UTM, the protection of intellectual property is emphasized given that it is the tool, at universities, to ensure that scientific and technological production can be exploited by their authors (Audretsch, Lehmann, & Wright, 2014). Another important mechanism of university management of emerging technologies is transfer from university to industry, which specifically consists of the links that each university generates with industry and the support that they give to the adoption of the technology, making it innovation that generates benefits within the economic and social domains (Geisler, 1995; Harmon et al., 1997; Miller, McAdam, & McAdam, 2016)

The aforementioned is achieved with mechanisms such as patent licensing, creation of technology-based companies, technical assistance, and training and professional development among others (Jiménez, Maculan, Otálora, & Cunha, 2013; Valencia, Morales, Vanegas, & Benjumea, 2017). In this regard, there are various models that have been adopted by universities to successfully achieve the objective of technology transfer, including creating Technology Transfer Offices (TTO's), which are responsible for giving the impetus needed to the new technologies and leading them to industry, often in the form of spin-offs or start-ups (Algieri, Aquino, & Succurro, 2013; Ramírez & García, 2010). However, in developing countries the processes of Research, Development and Innovation (R + D + i) do not receive adequate attention that is why it is useful to identify gaps in these processes with regard to international benchmarks and propose recommendations to overcome them (Bermúdez Hernández, Castañeda Riascos, & Valencia Arias, 2014; Valencia-Rodríguez, 2013; Villa, 2015).

3. METHODOLOGY

The methodology of this study involves the application of two techniques of qualitative research: a) benchmarking as a tool to analyze and compare processes of university management of emerging technologies in various fields and b) a case study for the diagnosis of university management of emerging technologies in a

research group of a developing country. These sources would allow us to identify the best practices of international benchmarks and gaps with respect to the case study.

3.1 Benchmarking as a Methodology to Identify Best Practices.

Benchmarking is a "systematic and continuous process to evaluate products, services and work processes of organizations that are recognized as representing best practices for the purpose of making organizational improvements" (Spendolini, 1992, p. 15). To carryout benchmarking, it is key to know what factors are to be measured and compared. Boxwell, Rubiera, McShane, and Zaratiegui (2008) point out the desirability of focusing on a small number of indicators to achieve the necessary improvements, for which it would be indispensable to know what the "key success factors (KSF)" that affect the performance of the organization or business are. Likewise, it is important to identify referents in the local context and also in the international context, in order to achieve a global comparison. Figure 2 shows the methodology of benchmarking conducted for this research, based on the authors mentioned above:

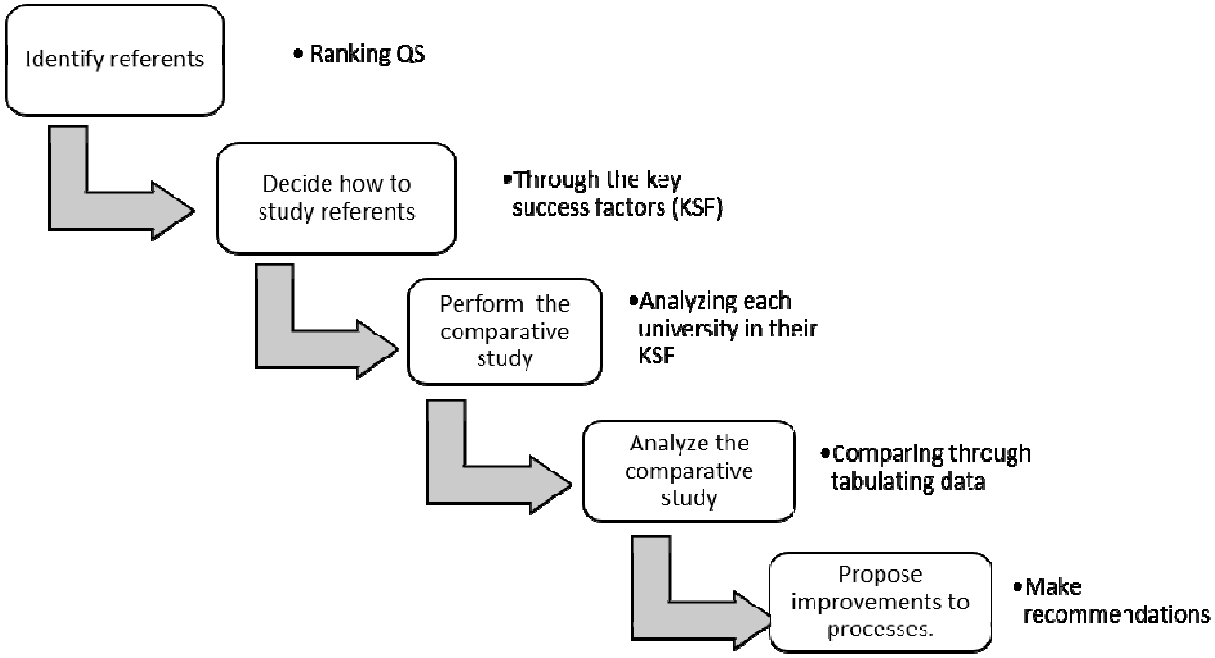


Figure Error! No text of specified style in document.**:** Process for the comparative analysis of university management of emerging technologies.
Source: (E. Villa, 2015)

To perform the benchmarking or comparative analysis as a methodological tool for this study, ten universities of excellence were selected at the global level through the classification made by the British firm Quacquarelli Symonds (QS World University Rankings, 2015). This classification comes from a study that is conducted and published annually ranking the top 600 universities in the world through four key pillars: research, teaching, employability and internationalization. Selected universities are shown in Table 1:

Table 1: Universities selected for benchmarking

Name of the University	Initials	Country	Classification according to the QS Ranking (World)
Massachusetts Institute of Technology	MIT	USA	1
University of Cambridge	UCAM	UK	2
University of Pennsylvania	UPENN	USA	13
University of British Columbia	UBC	Canadá	43
Pontifica Católica Universidad de Chile	UC	Chile	167
Universidad Nacional Autónoma de México	UNAM	México	175
Universidade Estadual de Campinas	UNICAMP	Brasil	206

Universidad de los Andes	UNIANDES	Colombia	262
Universitat Politecnica de Valencia	UPV	Spain	421
Universidad de Antioquia	UdeA	Colombia	501

Source: (Villa, 2015)

According to Arrubla, Oquendo, Preciado, and Londoño (2012), some key success factors identified in well ranked university research groups are coordinator leadership, commitment of members, research training, lines of research, organization, communication, and motivation; all of this framed within a proper university-business-state relationship and supported by a solid National Science, Technology, and Innovation System (NSTIS). In the same vein, Suárez and Díaz (2013) assert that, since they are vital elements in achieving organizational success, KSFs are key factors to be studied in organizations of interest such as the ones analyzed in this study (universities). Based on the authors consulted, the following key success factors for the implementation of benchmarking were selected:

Tabla 2: Key success factors (KSF) identified for benchmarking

Key Success Factors (KSF)	Description
a. Institution Factors at the Central Level	▪ Research Institution's Mission ▪ Strategic Educational and Research Alliances ▪ Technological and Communication Platform ▪ Libraries and library Resources ▪ Industrial Platform ▪ Interinstitutional Colaboration
b. Factors of the Institution's Research Group	▪ Existence of Research Groups Working with Emerging Technologies ▪ Research Group's Function ▪ Innovative Research Lines ▪ Industry-Academia Cooperation ▪ Custom Programs Originated in Research Groups ▪ Strategic Partnerships
c. Factors of the Technology Transfer Process	▪ Existence of an Agency or Office Leading the Process ▪ Research Mission of the Technology Transfer Agency ▪ Existence of an Office Responsible at the Central Level of the Process of Technology Transfer ▪ Support Programs for the Technology Transfer Process ▪ Additional Aspects on the Support of Emerging Technology Management

Source: prepared based on (QS World University Rankings, 2015; Villa, 2015)

3.2 Case study: Management of Emerging Technologies in a Research Group of a Developing Country.
The case study is a research methodology based on the importance of having direct contact with the object of study to generate knowledge. A contemporary case study is a research strategy aimed at understanding the dynamics present in unique contexts. In this regard, the combination of techniques is recommended by some authors to gather data in a mixed manner (qualitative and quantitative) in order to better "describe, verify or generate theory" (Eisenhardt, 1989, p. 8). Case studies are often used to study social phenomena, which are new and unexplored.

For the case study carried out in this research experience, the methodological design included a review of documentation, semistructured interviews and direct observations as suggested by (Yin, 2003). The case study was applied to the research group "Biotechnology" from University of Antioquia, Colombia. The selection of that focal case was made on the basis that this group manages an emerging technology, it is ranked as an A1 research group by Colciencias—the governmental institutional system that leads research technology and innovation in Colombia- and it had geographical accessibility (Villa & Jiménez, 2016).

4. FINDINGS AND DISCUSSION

Countries with developing economies are generating, adopting, and/or adapting emerging technologies; yet there are still many gaps to be closed for those countries to reach the level of developed countries in that field of interest. In the following paragraphs, findings of this study are presented followed by a discussion intended to

interpret them.

4.1 Findings

In order to illlustrate the analysis carried out in this study, Table 3 presents a contrast between the benchmarking and the case study results, using the key success factors analyzed for both the referent universities identified in the benchmarking and the university research group selected as the focus of the case study.

Table 3: Comparative analysis of key success factors: benchmarking-case study

Key Factors Analyzed	Referent Universities Concerning Benchmarking	Case Study
Institution Factors at the central level		
Research Institution's Mission	Yes	Yes
Strategic Educational and Research Alliances	Yes	Yes
Technological and Communication Platform	Yes	Yes
Libraries and Library Resources	Yes	Yes
Industrial Platform	Yes	Yes
Interinstitutional Colaboration	Yes	Yes
Factors of the Institution's research group		
Existence of Research Groups Working with Emerging Technologies	Yes	Yes
Research Group's Function	Yes	Yes
Innovative Research Lines	Yes	Yes
Research Resources at the University	Yes	No
Industry-Academia Cooperation	Yes	Deficient
Custom programs originated in Research Groups	Yes	No
Strategic Partnerships	Yes	Deficient
Factors of the Technology Transfer Process		
Existence of an Agency or Office Leading the Process	Yes	Deficient
Research Mission of the Technology Transfer Agency	Yes	Yes
Existence of an Office Responsible at the Central Level of the Process of Technology Transfer	Yes	Yes
Support Programs for the Technology Transfer Process	Yes	Deficient
Additional Aspects on the Support of Emerging Technology Management	Yes	Yes

Source: calculations based on results benchmarking- case study (Villa, 2015)

The case study revealed some key success factors in the focal case studied that were also found with benchmarking in world-renowned universities. However, the key success factors "Research Resources at the University", "Industry-Academia Cooperation", "Agency or Office that Leads the Technology Transfer Process", and "Support Program for Technology Transfer Process" were either not found in the case study or found to act deficiently. That finding raises evidence that the gaps that must be closed in the case of university management of emerging technologies could be related to those missing aspects. Nonetheless, an important key success factor found regarding the management of emerging technologies carried out in the case study was the existing leadership within the research group. That factor could not be evidenced in benchmarking due to the impossibility of real contact with the research groups at the benchmark universities.

4.2 Discussion

The analysis of the benchmarking evidenced that in the international context the success factors and best practices that lead referent universities to adequately generate and transfer emerging technologies are carried out in three realms of the organization: the contextual, the institutional, and the particular.

a. Regarding the contextual realm, these universities have a strong industrial, economic, financial and commercial environment, at the local, national, and international levels; moreover, technology monitoring processes are carried out from within the universities. Such context fosters the use and development of emerging technologies, which contribute to reduce the problems of the regions in which they are located; all the above mentioned framed by appropriate public policies aimed at promoting

science, technology and innovation (ST & I).

b. Regarding the institutional realm, it was evident that the universities studied have characteristics such as development of partnerships, agreements, participation, and interagency training to reduce the risk and uncertainty that comes with the management of emerging technologies. Similarly, they count on the support of technology platforms, systems of information and knowledge, as well as an institutional mission aimed at strengthening R & D + i. Such conditions stimulate the development, ownership and transfer of emerging technologies (ET), since they represent an adequate institutional support that allows and encourages these processes.
c. Regarding the particular realm, research groups as the basic units of research have support for their creation, maintainment and consolidation, both through institutional policies as well as with adequate and sufficient financial assistance. Likewise, they enjoy the existence of a technology management office supporting processes such as monitoring, evaluation, enrichment, optimization, protection and transfer of technology products.

In addition to the aforementioned and regarding the case study, we conclude that as a fundamental part of research group development, it is paramount to have an adequate leadership able to generate confidence, transmit passion for research, and stand out in the humanistic realm. Besides that, the analysis suggests the need of creating spaces adequate to overcome the sociocultural barriers that the introduction of emerging technologies in society generate as well as demonstrating how they would solve future problems and positively impact society.

Respecting emerging technology management, it was possible to make clear its particular characteristics and the challenges that its management imply.

a. Since these technologies do not count on historical data or real market figures that could help to predict their behaviour, it is necessary to provide them with suitable risk management. In this regard, the case study pointed out this as one of the aspects to improve in order to generate confidence on the entrepreneur to gain access to resources that would permit the generation of innovative projects.
b. It is important to acknowledge the role of emerging technologies to guarantee the future of humanity. It was evident that those areas of research (in this case biotechnology) are of paramount importance to tackle the effects of climate change; thus, it is impossible to disregard the significance of the technology under management despite the high risk and uncertainty that it generates in the market.
c. The impact of technology is unknown. In spite of studies being conducted around it, it is impossible to predict the uses that these technologies could attain, starting with its merging with other technologies—in the case study, for example, the already mentioned bionanotechnolgy.

Based on the comparative analysis between the case study and the benchmarking, it was evident that these characteristics of emerging technologies are managed from within the university, with appropriation of technology by the industry and supported by the research groups, and with dissemination of knowledge around it and strategic alliances with the enterprise, the state, and other research groups that also work on innovative lines. In addition, the university management of emerging technologies is supported by cross-sectional processes of technology management such as technology monitoring, competitive intelligence, and proper management of intellectual property.

5. CONCLUSIONS AND RECOMMENDATIONS

As a result of the study conducted, a series of conclussions and recommendations that would allow to narrow the gaps between benchmark countries and developing countries (as is the case of Colombia), with respect to the university management of emerging technologies, arose:

a. Universities should strive for appropriate management of these technologies as they will be the basis of future changes in market dynamics. However, it is important to consider that emerging technologies represent risks and uncertainties in the market; reason for which creating a risk fund is highly recommended. This will allow leveraging these investigations. In this regard, it would also be advisable to create tax incentives to enable universities to access resources, encouraging research specifically on emerging technologies.
b. Universities should be provided real and effective support by the units of technology management and entrepreneurship to create spin-offs. In this sense, there is a need towards fostering entrepreneurial universities and managing knowledge to carry out this process efficiently, conducting studies on success stories, and adapting the factors that are suited to the characteristics of the particular context of each developing country.
c. Finally, it is advisable to reflect on the importance of support for research, development and innovation

for developing countries (such as Colombia), since without these processes the country will lag behind. For this, it is not only convenient to make a substantial investment year after year in Science, Technology and Innovation, but also to consider that project management and management of research groups and technologies, are different from management of teaching and even of extension. Research has been, and will continue to be, a completely different process due to the time, resources and activities that it requires.

REFERENCES

Aceves, N., Siller, A., Torres, A., & Martinez, O. (2013). TECHNOLOGY BASED ENTREPRENEURSHIP: CHALLENGES AND OPPORTUNITIES TO ENHANCE A UNIVERSITY SPINOFF. *ICERI2013 Proceedings*, 370–378.

Adner, R., & Levinthal, D. A. (2002). The emergence of emerging technologies. *California Management Review*, *45*(1), 50–66.

Algieri, B., Aquino, A., & Succurro, M. (2013). Technology transfer offices and academic spin-off creation: The case of Italy. *Journal of Technology Transfer*, *38*(4), 382–400. https://doi.org/10.1007/s10961-011-9241-8

Arrubla, J. P., Oquendo, S., Preciado, J. M., & Londoño, J. O. (2012). Factores clave de éxito de los grupos y centros de Investigación de excelencia y consolidados de la Universidad de Antioquia. *Unipluriversidad*, *1*(1), 17–23.

Arvanitis, R., & Villavicencio, D. (1994). Transferencia de tecnología y aprendizaje tecnológico. *Reflexiones Basadas En Trabajos*. Retrieved from https://www.researchgate.net/profile/Rigas_Arvanitis/publication/46548039_Transferencia_de_tecnologia_y_aprendizaje_tecnologico_Reflexiones_basadas_en_trabajos_empiricos/links/0912f5119012ddfffa000000.pdf

Atanu, S., Love, H. A., & Schwart, R. (1994). Adoption of emerging technologies under output uncertainty. *American Journal of Agricultural Economics*, *76*(4), 836–846.

Audretsch, D. B., Lehmann, E. E., & Wright, M. (2014). Technology transfer in a global economy. *Journal of Technology Transfer*, *39*(3), 301–312. https://doi.org/10.1007/s10961-012-9283-6

Bermúdez Hernández, J. B., Castañeda Riascos, M. C., & Valencia Arias, J. A. (2014). El papel de la integración universidad-empresa-estado como estrategia en el fortalecimiento de los Sistemas Regionales de Innovación. *Espacios*, *35*(13).

Bernardt, Y., Meijaard, J., & Kerste, R. (2002). *Spin-off start-ups in the Netherlands*. EIM Business and Policy Research.

Bhattacherjee, A. (1998). Managerial Influences on Intraorganizational Information Technology Use: A Principal-Agent Model. *Decision Sciences*, *29*(1), 139–162. https://doi.org/10.1111/j.1540-5915.1998.tb01347.x

Borges, C., & Jacques Filion, L. (2013). Spin-off process and the development of academic entrepreneur's social capital. *Journal of Technology Management & Innovation*, *8*(1), 21–34.

Boxwell, Rubiera, McShane, & Zaratiegui. (2008). Benchmarking para Competir con Ventaja, 203.

Cabrera, A. M. G., & Soto, M. G. G. (n.d.). EMPRENDEDURÍA DE BASE TECNOLÓGICA: HACIA UN MODELO DINÁMICO.

Castrejón Mata, C., Hernández Sampieri, R., & Ruiz Rueda, H. (2014). Análisis de modelos de gestion tecnológica en centros de investigación. *RAITES Antes PANORAMA ADMINISTRATIVO*, *6*(10), 5–20. Retrieved from http://admon.itc.mx/ojs/index.php/panorama/article/viewArticle/210

Day, G. S., & Schoemaker, P. J. H. (2000). Avoiding the pitfalls of emerging technologies. *California Management Review*, *42*(2), 8–33. https://doi.org/10.2307/41166030

Day, G. S., & Schoemaker, P. J. H. (2004). Driving through the Fog: Managing at the Edge. *Long Range Planning*, *37*(2), 127–142. https://doi.org/10.1016/j.lrp.2004.01.004

Díez Echavarría, L. F., Valencia Arias, J. A., & Villa Enciso, E. M. (2015). Promoción de la cultura investigativa como motor de desarrollo económico y social: Una visión sistémica. *Espacios*, *36*(1).

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.2307/258557

Fleischer, T., Decker, M., & Fiedeler, U. (2005). Assessing emerging technologies—Methodological challenges and the case of nanotechnologies. *Technological Forecasting and Social Change*, *72*(9), 1112–1121.

Forum, W. E. (2016, August 11). Las 10 tecnologías Emergentes de 2016. *Foro Económico Mundial*. Retrieved from https://www.weforum.org/es/agenda/2016/06/las-10-tecnologias-emergentes-de-2016/

Frewer, L. (1999). Risk perception, social trust, and public participation in strategicdecision making: implications for emerging technologies. *AMBIO - A Journal of the Human Environment*, *28*(6), 569. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=8gh&AN=8375444&site=ehost-live

Friedman, J., & Silberman, J. (2003). University technology transfer: do incentives, management, and location matter? *The Journal of Technology Transfer*, *28*(1), 17–30.
Gavankar, S., Anderson, S., & Keller, A. a. (2014). Critical Components of Uncertainty Communication in Life Cycle Assessments of Emerging Technologies. *Journal of Industrial Ecology*, *19*(3), 468–479. https://doi.org/10.1111/jiec.12183
Gaynor, G. (1999). *MANUAL DE GESTION EN TECNOLOGIA. TOMO 1*. Retrieved from http://dspace.ucbscz.edu.bo/dspace/handle/123456789/3173
Geisler, E. (1995). Industry–university technology cooperation: a theory of inter-organizational relationships. *Technology Analysis & Strategic Management*, *7*(2), 217–229.
Gil, A., & Zubillaga, F. (2006). Los ciclos de vida de las tecnologías y la evolución de sistemas. La existencia de factores limitantes en la innovación.
Godwin-Jones, R. (2003). Emerging technologies. *Language Learning & Technology*, *7*(2), 12–16.
González Arango, Ó., Schmal Simon, R., Gonzalez Arango, O., & Schmal Simon, R. (2005). Descripción del sistema universitario de Colombia y de Chile: una relación comparativa. *Cuadernos de Administración*, *18*(30), 221–240. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=35043724&lang=es&site=ehost-live
Gür, U., Oylumlu, İ. S., & Kunday, Ö. (2016). Critical assessment of entrepreneurial and innovative universities index of Turkey: Future directions. *Technological Forecasting and Social Change*. https://doi.org/10.1016/j.techfore.2016.09.008
Halaweh, M. (2013). Emerging Technology: What is it? *Journal of Technology Management & Innovation*, *8*(3), 19–20. https://doi.org/10.4067/S0718-27242013000400010
Harmon, B., Ardishvili, A., Cardozo, R., Elder, T., Leuthold, J., Parshall, J., … Smith, D. (1997). Mapping the university technology transfer process. *Journal of Business Venturing*, *12*(6), 423–434.
Howland, K., Good, J., & Robertson, J. (2007). A learner-centred design approach to developing a visual language for interactive storytelling (pp. 45–52). ACM. Retrieved from http://dl.acm.org/citation.cfm?id=1297286
Hung, S.-C., & Chu, Y.-Y. (2006). Stimulating new industries from emerging technologies: challenges for the public sector. *Technovation*, *26*(1), 104–110.
Jiménez, C. N., Castellanos, O. F., & Morales, M. E. (2007). Tendencias y retos de la gestión tecnológica en economías emergentes. *Revista Universidad EAFIT*, *43*(148), 42–61. Retrieved from http://publicaciones.eafit.edu.co/index.php/revista-universidad-eafit/article/view/701
Jiménez, C. N., Maculan, A. M., Otálora, I., & Cunha, R. M. (2013). Reflexiones sobre los mecanismos de transferencia de conocimiento desde la universidad: el caso de las Spin-offs. *ALTEC 2013. XV Congreso Latino-Iberoamericano de Gestión Tecnológica*, 1–16. https://doi.org/10.13140/2.1.2656.0963
Khanagha, S., Volberda, H., Sidhu, J., & Oshri, I. (2013). Management innovation and adoption of emerging technologies: The case of cloud computing. *European Management Review*, *10*(1), 51–67. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/emre.12004/full
Llanos, R. A. (2004). La universidad: un factor clave para la innovación tecnológica empresarial. *Pensamiento Y Gestión: Revista de La División de Ciencias Administrativas de La Universidad Del Norte*, (16), 28–42. Retrieved from http://dialnet.unirioja.es/servlet/articulo?codigo=2497598
Miller, K., McAdam, R., & McAdam, M. (2016). A systematic literature review of university technology transfer from a quadruple helix perspective: toward a research agenda. *R&D Management*.
Mowery, D. C., & Shane, S. (2002). Introduction to the special issue on university entrepreneurship and technology transfer. *Management Science*, *48*(1), v–ix.
Navas, M. E., Londoño, E., Ruiz, S., & Ruiz, D. (2012). State of the Art of Emerging Technologies in Colombia. In *2012 Proceedings of PICMET '12: Technology Management for Emerging Technologies* (pp. 358–367).
Newman, G., Wiggins, A., Crall, A., Graham, E., Newman, S., & Crowston, K. (2012). The future of citizen science: emerging technologies and shifting paradigms. *Frontiers in Ecology and the Environment*, *10*(6), 298–304.
Ortiz-Riaga, M. C., & Morales-Rubiano, M. E. (2011). La extensión universitaria en América Latina: concepciones y tendencias. *Educación Y Educadores*, *14*(2), 349–366.
Pineda, L. (2013). PROSPECTIVA ESTRATÉGICA EN LA GESTIÓN DEL CONOCIMIENTO: UNA PROPUESTA PARA LOS GRUPOS DE INVESTIGACIÓN COLOMBIANOS. (Spanish). *Strategic Prospective in Knowledge Management: A Proposal for Research Groups in Colombia. (English)*, *21*(1), 237–259.
QS World University Rankings. (2015). QS World University Rankings® 2014/15.
Ramírez Salazar, M. del P., & García Valderrama, M. (2010). La Alianza Universidad-Empresa-Estado: una estrategia para promover innovación. *Revista EAN*, *68*, 112–133.
Review, M. I. T. T. (2016, August 11). "MIT Technology Review":10 Tecnologías Emergentes de 2016.

Retrieved from http://www.technologyreview.es/negocios/49368/mit-technology-review-presenta-las-10-tecnologias/

Rip, A. (2011). The future of research universities. *Prometheus*, *29*(4), 443–453. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/08109028.2011.639566

Siegel, D. S., Waldman, D., & Link, A. (2003). Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study. *Research Policy*, *32*(1), 27–48.

Silva, A., & Nuño, J. P. (2014). Design of an Expert System Model for the Analysis of the Innovation Technology Management Process: A Case Study at the University of Coahuila, México. *IIE Annual Conferance*.

Spendolini, M. J. (1992). *The Benchmarking Book*. *Compensation & Benefits Review* (Vol. 24). https://doi.org/10.1177/088636879202400505

Suárez, & Díaz. (2013). La investigación científica latinoamericana en el contexto mundial. In *GT N°1 Ciencia, Tecnología e Innovación*.

Tapias G., H. (2000). GESTIÓN TECNOLÓGICA Y DESARROLLO TECNOLÓGICO. Universidad de Antioquia. Retrieved from http://datateca.unad.edu.co/contenidos/203029/contenidos gestion tecnologica/GESTION_TECNOLOGICA_Y_DESARROLLO_TECNOLOGICO.pdf

Tegarden, L. F., Lamb, W. B., Hatfield, D. E., & Ji, F. X. (2012). Bringing emerging technologies to market: Does academic research promote commercial exploration and exploitation. *IEEE Transactions on Engineering Management*, *59*(4), 598–608. https://doi.org/10.1109/TEM.2011.2170690

Valencia-Rodríguez, M. (2013). Generación Y Transferencia De Conocimiento / Generation and Transfer of Knowledge. *Ingeniería Industrial*, *34*(2), 178–187.

Valencia, Morales, Vanegas, & Benjumea. (2017). Percepción y conocimiento de los docentes universitarios sobre los procesos investigativos universitarios : estudio de caso, 1–20.

Villa, E. (2015). *Análisis de la Gestión de Tecnologías Emergentes (GTE) en grupo de investigación colombiano e identificación de brechas respecto a referentes internacionales*. Universidad Nacional de Colombia, Medellín. Retrieved from http://www.bdigital.unal.edu.co/50824/

Villa, E., Echeverry, J., & Jiménez, C. (2015). Perspectives of university magement from a comparative analysis of the management of traditional and emerging technologies. (pp. 775–792). Retrieved from https://www.iet-c.net/publication_folder/ietc/ietc2015.pdf

Villa, E. & Jiménez, C. N. (2016). Gestión de Tecnologías Emergentes : Estudio de Caso en un grupo de investigación universitario colombiano, (c), 1–16. Retrieved from http://www.revistaespacios.com/a16v37n31/16373114.html

Yin, R. (2003). Case Study Research: Design and Methods. Sage Publications Inc.

Are We Ready for E-books? Omani University Students' Uses and Perceptions of E-books

Al Saadi, Khalid
saadi@squ.edu.om

Lane-Kelso, Mary

Al Hafeedh, Anisa

Al Sheithani Zainab

Al Wishahi, Mariam

ABSTRACT
As the presence of e-books on university campuses proliferate, it is crucial that we understand their role in students' lives. This research reports on a survey distributed to Sultan Qaboos University students and shares their perceptions of the use of e-books. The study used the quantitative approach to investigate the issues related to the uses and perceptions of e-books by asking students to weigh in on this important issue. The findings indicate that students at SQU have multiple and diverse experiences with e-books, but do not necessarily prefer the electronic format over print for their academic experiences. Despite e-books growing presence, students may need more time and encouragement to change their use and preferences to e-books so exclusively.

Keywords: e-books, uses, perceptions, university students, Oman

INTRODUCTION

E-books have recently gained rapid acceptance among higher education institutions around the world as the favored format for text resources. Like other academic institutions, Sultan Qaboos University (SQU) in the Sultanate of Oman realizes the importance of e-books and its responsive role in sustainability. Since e-books tend to be somewhat cheaper compared to print books, it offers academic institutions access to knowledge regardless of the shortage of spaces or required budget. E-books also offer educators and students opportunities to view the desired content of their preferred books in a novel format which could be more engaging when utilizing some of its interactive and attractive features. Currently, SQU is planning to make e-books available for its academic staff, researchers and students as the primary format of instruction.

However, this may pose some challenges in the future due to the feasibility of e-books if they are not the widely favored resource of instruction and research for students. Therefore, this paper aims to gain insights into the perceptions of SQU students of the use of e-books in their learning programs, particularly the students' perceived role of e-books and their current use in their university experiences. This study contributes to the literature of students' perceptions and use of e-books and their viable replacement for print books in higher education by gathering insights of how the use of e-books can be envisioned in academia by SQU students.

The study begins with a review of the literature on previous research done on students' e-book use and perception followed by a description of the methodology used. The findings the *SQU Students Use and Perceptions of E-Books Survey* are reported and discussed. Finally, recommendations and future research are suggested to conclude the paper.

LITERATURE REVIEW

The high visibility of e-books in the academic market got its start in 1971 with the Gutenberg Project which began making plain text books freely available in the electronic format. Over time and as a result of the advancements in the e-books market, e-books evolved into forms of readers and databases. These two technologies eased the accessibility and feasibility of e-books for both academic and non-academic uses. Electronic readers were introduced in 1990s with the release of the SoftBook and the Rocket e-book but did not gain popularity until the mid-2000s with the introduction of Sony's Librie, Amazon's Kindle, Barnes & Noble's Nook, and Apple's iPad (Kossey & Brown, 2011). Since the introduction of these more advanced e-readers, the

use of e-books increased globally and users' awareness and perceptions have evolved accordingly (Liaw & Huang, 2014).
Defining e-books has also evolved as a result of the changing features of the e-books over time. Researchers do not agree there is one distinctive definition of what it actually means (Nelson, 2008; Tripathi & Jeevan, 2008; Doering, Pereira & Kuechler, 2012; Gonzalez, Gasco & Llopis, 2014; Liaw & Huang, 2014). For some researchers, an e-book is viewed as a text or book that can be read in a digital format using technology devices such as computers, smart phones, tablets or any portable reading machine (Nelson, 2008; Tripathi & Jeevan, 2008; Liaw & Huang, 2014). Others view it as text designed to be read over technology devices, making it different from printed books by offering some extra features that allow users to interact with the text through the use of sound, visuals and links (Baki, 2010). Still others describe it as a digital format created with an abundance of new features such as search and cross reference functions, multimedia features and hypertext links (Vassiliou & Rowley, 2008). Regardless of all these different views and definitions of e-books, they all seem to agree that an e-book involves the use of technology tools to view and read books.

While research on e-books is fairly new, a review of the literature reveals that students are beginning to use e-books as a result of the development of the e-book technologies and devices. These developments offer many advantages over printed books. One of these advantages is that e-books are often marketed as cost –effective for students (Johnson et al., 2010). Another advantage is their convenience as they save institutions from using so much physical space by being stored digitally (Pattuelli & Rabina, 2010). In addition, e-books are convenient in terms of mobility as readers do not have to worry about their heavy weight (Kiriakova et al., 2010) as they can carry a whole digital library in their pockets. E-books have the added advantage of being accessible. They allow teachers and students to easily access them online at any time and wherever needed (Lam, Lam, & McNaught, 2010; Letchumanana & Tarmizib, 2010; Doering, Pereira & Kuechler, 2012). Further, e-books allow users to search them easily to support their teaching and learning (Abram, 2010). Finally, e-books are user friendly, can be annotated, copy and paste text, and for some users, they are easier to read (Doering, Pereira & Kuechler, 2012).

Despite of the cost effectiveness, convenience and portability of e-books, they lack universal standards and the compatibility of hardware and software (O'Hare & Smith, 2012). As well, many e-books are difficult to access because they are not globally available or not offered in the e-book format (Liaw & Huang, 2014). In addition, e-books can require long download times, do not allow portion printing, can consume more time to access and read, encourages students' overreliance on technologies, and demotivates students from using the library (Jamali et al., 2009). Adding to that, many students may not know how to use the e-book readers and require specific training (Baki, 2010). Further, heavy use of e-books may result in health problems such as headaches and eyestrain (Liaw & Huang, 2014). Finally, many of the e-books that are available in the market are simply copied and pasted from the traditional printed books. They lack the interactive features that enable and support learners with "tools for learning outside the classroom, where students may not meet face-to-face to share and discuss resources and ideas" (Lim & Hew, 2014, p. 35).

In spite of the positives and negatives of e-books, e-books are generally regarded as offering great potential for teaching and learning (Armstrong et al., 2006). Many studies have been done to investigate the use of e-books as a learning medium in a way to enhance students' learning process. Sun et al. (2012) conducted a survey to measure students' perceptions on how the use of e-books may enhance their learning. The results indicate that the students' perceptions on how helpful e-books are for facilitating their learning directly affect students' learning. In other words, if a student thinks that an e-book is helpful, his/her learning outcomes will enhance as a result. Additionally, the researchers also found that the students' use of e-books in class can positively affect their learning outcomes as well. They concluded that e-books can have enormous contribution to students' learning because of the additional features they offer. Such features should engage students in using e-books in class and lay the foundation for successful adoption of e-books.

Another recent study done by Lim and Hew (2014) explored the usefulness of the next-generation e-book (NG-eBook) that has capabilities of annotation and sharing to promote students' learning through reflection and sharing of ideas. The key technical features of their e-book software were navigation, content management, and collaboration. The study found that e-books can enhance students' learning by allowing them to engage and interact with each other to discuss and construct knowledge. Liaw and Huang (2014) also explored the use of e-books as a learning tool. The authors developed a research model based on the activity theory approach, a framework to investigate how social systems work while completing activities, to understand learners' attitudes toward e-books. The results suggest that the screen size could affect learners' perceived self-efficacy. They also found that the interactivity of e-books could have positive effects on students' perceived satisfaction with the usefulness of e-books as a learning tool.

Consequently, many academic institutions began to embrace the use of e-books through their libraries (Wu & Chen 2011) assuming that since students have grown up with technologies, they might want to abandon the use of printed books (Gregory, 2008). Some institutions allocated ample budgets to buy e-books and gradually decreased the number of print books (Wu & Chen 2011). However, that assumption failed to some extent as the acceptance of using e-books for academic purposes has not moved as quickly as predicted (Muir & Hawes, 2013), regardless of the advent of the emerging technologies. This slowness of acceptance might be associated to the lack of resources and awareness of its use (Wiese & du Plessis, 2015). Other research studies report that students prefer to use print books compared to e-books when it comes to academic reading (Gregory, 2008; Strother, et al., 2009; Nicholas & Lewis, 2008). However, their preference for the traditional text books might not indicate their real experience with using e-books depending on how they perceive its definition (Sun & Tanguma, 2012; Wiese & du Plessis, 2015). This is in agreement with the study done by Gregory (2008) which states that student prefer using print books because print books are easy to navigate.

In light of the above, a review of the available literature reveals that no study about students' perceptions on the use e-books has been conducted in the context of Oman. Thus, this research is important for SQU academics as it may offer insights to understand how Omani students perceive the use of e-books. It is hoped that the findings of this research could assist in planning successful implementation of e-books resources for SQU students.

Methodology

To investigate the uses and perceptions of e-books by SQU students, the researchers of this study reviewed other studies and how other universities explored this topic. A well-constructed survey developed at St. Mary's University College by Mulholland and Bates (Mulholland & Bates, 2014) closely fit the study focus and with permission was adopted and modified to adapt to the student target audience's language and culture. The *SQU Students Use and Perceptions of E-Books Survey* included 24 questions (see Appendix). The first four questions aimed to gather information about the respondents' demographic information. The survey also contained questions about the definition of e-book, its usage, purpose and frequency of use, its advantages and disadvantages. The last questions were the main elements of the survey, which asked about the preference for using e-books versus print books, the reasons for using them and how they envision their future use in their lives. Six additional open-ended questions were embedded throughout the survey to allow for more in depth responses and explanations for specific questions. The survey was then uploaded in both Arabic and English to SmartSurvey, an online subscribed survey application that would allow access to all the SQU students in the different SQU colleges.

The survey questions were validated by five highly experienced educational researchers in the SQU College of Education. After gaining the permission from SQU Academic Research Office, the survey was distributed to all SQU students through the university email system during the fall semester of 2015. The email message sent to all students included instructions to access the survey, a hyperlink to the survey application and a statement that assured confidentiality. The steps taken in this study were traced to maintain a chain of evidence to increase reliability of information as well as validity of the methods. Results from this survey were collected throughout the fall of 2015 and the results were analyzed in the spring of 2016. Analysis was conducted through an iterative process that took the form of categorical aggregation, axial coding for patterns and themes, and direct interpretation. Disaggregation of core themes through open, axial coding was framed in grounded theory. Data results from the open-ended questions helped to form the narrative that the role e-books has for students, particularly in academia. In addition, potential barriers and cultural implications for e-book usage were identified during analysis and interpretation of the feedback.

RESULTS

The results section of this paper is organized around the main research and divided into three parts. The first describes the *SQU Students Use and Perceptions of E-Books Survey* participants' demographics. The second part reports their use of e-books reporting for general and academic uses. The third part the *SQU Students Use and Perceptions of E-Books Survey* participants' reports on their perceptions of e-books from general and academic frameworks.

Demographics

The profile of the survey respondents was established from the demographics section of the survey distributed during the fall semester of 2015 with 425 students taking part in the survey. Females account for approximately 66% of the overall respondents with the majority. Overall, 68.70% of all respondents having been at SQU for 3 years or less. By far, the majority of respondents (84.94%) are currently earning their Bachelors degree at SQU. The distribution of respondents' studies spread over all nine colleges at SQU with the bulk of the respondents

(79.76%) coming from the College of Arts and Social Studies, College of Education, College of Engineering, College of Science, College of Economy and Political Science. The majority of SQU students (79.53%) rated their skills in using computer technologies as either good or excellent and accessing the Internet either daily (27.53%) or several times a day (62.12%). Refer to Table A. below for the student demographic information.

Table A. Student Demographics

Gender	n	Percent
Females	279	65.65%
Males	146	34.35%

Degree Level	n	Percent
Diploma	15	3.53%
Bachelor	361	84.94%
Master	36	8.47%
PhD	13	3.06%

# of Years at SQU	n	Percent
1	131	30.82%
2	96	22.59%
3	65	15.29%
4	58	13.65%
5	50	11.76%
6	14	3.29%
7	7	1.65%
More Than 7 Years	4	.94%

College of Study	n	Percent
Agriculture	32	7.53%
Arts and Social Studies	86	20.24%
Economy and Political Science	51	12.00%
Education	78	18.35%
Engineering	65	15.29%
Law	15	3.53%
Medicine	27	6.35%
Science	59	13.88%
Nursing	12	2.82%

Computer Skills	n	Percent
Poor	7	1.65%
Average	52	12.24%
Good	153	36.00%
Excellent	185	43.53%
Expert	28	6.59%

How Often Access Internet	n	Percent
Several times a day	264	62.12%
Daily	117	27.53%
Every couple days	36	8.47%
Weekly	4	.94%
Rarely	4	.94%

Use of E-Books: General

The majority of students (80.24%) responding to this survey have had experience using e-books. When asked what purpose do they usually use e-books for, most chose either in their studies for reading resources (65.98%), in their research (62.46%), or in their leisure (66.86%). When adding the respondents choosing the purpose being in their studies for designing resources (14.08%), it appears the major purpose for using e-books among the SQU student sampled is for their studies. When asked what other purpose they may add for using e-books, the students identified reading as a hobby as their main purpose besides accessing non-printed books and books not available in the country (Table 1). When students were asked to identify the sources of e-books, the majority

of choices (52.20%) were social networking sites. However, two close seconds included the university e-library (43.40%) and sharing applications and websites (42.52%) with university course materials having just over a quarter of the responses (26.69%). MOOCs training (24.05%) and ITunes U (10.56%) comprised the other choice of e-books sources. Students also listed commercial and free e-libraries among the other sources (Table 2).

Table 1. Purpose of E-book Use

Purpose	n	Percent
In my study for reading resources	225	65.98%
In my study for designing resources	48	14.08%
In my research	213	62.46%
Other areas of interest (Leisure)	228	66.86%
Other	18	5.28%

Table 2. Source of E-books

Source	n	Percent
Social networking sites	178	52.20%
University e-library	148	43.40%
Sharing applications and websites	145	42.52%
University Course Materials	91	26.69%
MOOCs	82	24.05%
ITunes U	36	10.56%
Other	29	8.50%

When asked how much time in a week they usually spend using e-books, the highest number of responses was less than 30 minutes (36.36%). Less than a quarter (22.87% and 21.70% respectively) responded they spent 30 minutes to an hour and one to two hours per week using e-books (Table 3). The majority of students (59.23%) reported they spent more than 10 minutes reading an e-book from a screen (Table 4) with the most typical student use reported as either browsing through the chapters or searching through the contents page. The second and third highest responses of typical use of e-books were using the search tools to identify key words within the books (35.78%) and reading entire book chapters (35.48%) (Table 5).

Table 3: Time Using E-books/Week

Time	n	Percent
less than 30 min	124	36.36%
30 minutes–1 hour	78	22.87%
1–2 hours	74	21.70%
2–5 hours	42	12.32%
5–10 hours	14	4.11%
11+ hours	9	2.64%

Table 4: Time Reading an E-book from the Screen/Session

Time	n	Percent
less than 3 minutes	25	7.33%
3–5 minutes	35	10.26%
6–10 minutes	79	23.17%
11–20 minutes	84	24.63%
21+ minutes	118	34.60%

Table 5: General Uses of E-books

Uses	n	Percent
Browse through the chapters	195	57.18%
Read entire chapters	121	35.48%
Use the search tools to identify key words within the books	122	35.78%
Scan information quickly	101	29.62%
Search through the contents page	189	55.43%

Annotate (highlight) text that was useful	98	28.74%
Copy and paste text into MSWord or other software	77	22.58%
Print out pages to read in print	60	17.60%

Use of E-Books: Academic

When asked how much they depend on e-books for learning and research, the majority of the students (41.35%) chose the low and the lowest scale for their responses. However, responding to the same question, a substantial percentage of the remaining student population (26.98%) chose the high and the highest scale of use that depended on e-books for learning and research. Considering the wide-spread use of print materials in the traditional university setting in this region, it was surprising to the researchers that almost a third responded on the dependence of e-books for their studies (Table 6). When asked about whether and how their instructors recommend or actively encourage them or their classmates to use e-book materials, students responded with mixed results often choosing more than one way e-books were being used. Less than half (42.23%) reported instructors did not include them, while the remainder (43.33%) reported instructors included the e-books in the online course management system (*Moodle/Blackboard)*, and/or included e-books as course materials (22.58%), and/or e-books were on their reading lists or handouts (18.77%). SQU faculty members appear to encourage the electronic book materials for their students far more than initially expected by the researchers (Table 7).

Table 6: Academic Use of E-books

Learning/Research Use	n	Percent
highest dependency	35	10.26%
high dependency	57	16.72%
average dependency	108	31.67%
low dependency	74	21.70%
lowest dependency	67	19.65%

Table 7: Instructor Recommend or Include E-books

Instructor Recommend or Include E-book Use	n	Percent
Yes, e-books are included in *Moodle/Blackboard* resources	147	43.11%
Yes, e-books are included on my reading list or handouts	64	18.77%
Yes, e-books are included as course materials	77	22.58%
No	144	42.23%

Perceptions of E-Books: General

The critical question pertaining to e-book perceptions is how students define an e-book. Early in the *SQU Students Use and Perceptions of E-Books Survey* this question was asked with more than a third (38.82%) of the responses defining e-books as "an electronic version of a printed book that can be read on a computer or handheld device designed specifically for this purpose." Even more chose the response of all of the above (47.29%), which allowed more flexibility in the definition. In addition to the response quoted above, this included "a dedicated device for reading electronic versions of printed books", "text in pdf file format", and "a digitally presented format of information with embedded enhancements that includes multimedia published by an authorized distributor." (Table 8)

Table 8: E-book Definition

Definition	n	Percent
An electronic version of a printed book that can be read on a computer or handheld device designed specifically for this purpose	165	38.82%
A dedicated device for reading electronic versions of printed books.	9	2.12%
Text in .pdf file format	23	5.41%
A digitally presented format of information with embedded enhancements that include multimedia published by an authorized distributor.	13	3.06%
I would consider all of the above an e-book to me.	201	47.29%
I don't know how to define an e-book.	10	2.35%
Other (please specify):	4	0.94%

When asked about advantages of using e-books, the majority of students (85.63%) identified the ease-of-access e-book aspect as the biggest advantage with the convenience and remote access being the second most often chosen answer (66.28% and 62.17%). It is worth noting here that more than 50% of students recognized the embedded search tools added greatly to the value of e-books. Nevertheless, 34.60% of students stated that the availability of a big range of titles to choose from was another advantage. Respondents also identified the following other advantages: lightweight, save time and effort, cost effective compared to printed books, and ease of translation (Table 9).

Table 9: Perceived Advantages of Using E-books

Advantage	n	Percent
Ease of access — ability to access books anytime/anywhere (24/7)	292	85.63%
Usefulness of search tools and other available features	178	52.20%
Automatic referencing/citations	93	27.27%
Off campus access (remote access)	212	62.17%
Convenient/fast and easy	226	66.28%
Good range/selection of titles	118	34.60%
Other (please specify):	17	4.99%

On the other hand, the majority of students (68.91%) identified the discomfort and difficulty reading from the screens as the largest disadvantage to e-books with a lack of choice of titles for relevant subject areas (25.22%) and titles in Arabic (24.93%) coming in a distant second. Students also identified the slow speed of loading and downloading e-books (23.17%) as another disadvantage. Other disadvantages reported by students were the unavailability of text to speech facility on their devices (17.30%) and limited off-campus access to the university e-library (7.62%). In addition to these disadvantages, students also identified other disadvantages of the following: causes health problems, need to buy some of the e-books, difficulty of writing direct notes, distractions caused by other applications while reading the e-book from devices, and losing the sense of reading enjoyment as it is with printed books (Table 10).

Table 10: Perceived Disadvantages of Using E-books

Disadvantage	n	Percent
Discomfort/difficulty reading from the screen	235	68.91%
Lack of choice of e-book titles for the subject areas relevant to my study area	86	25.22%
Could not gain access off-campus	26	7.62%
Lack of choice of e-book titles in Arabic	85	24.93%
Pages take too long to navigate/too slow	79	23.17%
No facility to have the text read out loud	59	17.30%
Other (please specify):	35	10.26%

When asked for the reasons why those students reported not having used e-books, the majority of the respondents reported that they had a preference for printed books (62.79%). Other reasons for not using e-books was reported that they did not know about them, they had difficulty reading from the screen and they had difficulty accessing them which made up the bulk of the remainder of reasons (31.40%, 27.91%, and 25.58% respectively). It is worthwhile noting here that the response rate to this and the remaining questions of the survey dropped dramatically to only 86 respondents. This part of the survey was only displayed to the students who had responded that they had not used e-books previously (Table 11).

Table 11: Reasons for Not Using E-books

Reason	n	Percent
Never knew about them	27	31.40%
I prefer to use printed books	54	62.79%
Had difficulty accessing them/couldn't find them	22	25.58%
I find it difficult to read e-books from the screen	24	27.91%
I was unaware of relevant titles for the subject I study	9	10.47%

When asked to predict the role of e-books in their lives within the next 5 years, almost half the respondents (47.67%) predicted that the combination of using, both print and electronic, would be their preference and an

additional number (10.47%) reported they prefer the electronic format. Nearly a third of the respondents predicted they would be reading print books (30.23%) so the results again show varied predictions about the future of e-book usage in their lives with a preference toward print books (Table 12).

Table 12: Role of E-books within 5 years' Time

Role	n	Percent
For some books, I will prefer to read print books, for others I will prefer the e-book.	41	47.67%
I will mostly read print books	26	30.23%
I will mostly read e-books	9	10.47%
I don't know	10	11.63%

Perceptions of E-Books: Academic

A critical question asked to those who reported using e-books was their preference for e-books or printed books to be used for their subject areas of academia. Again, the student respondents reported in a sizable majority (65.98%) that they preferred a printed book. The reasons stated by the respondents were mixed. Most of these reasons are related to advantages and disadvantages of e-books and qualitatively analyzed (Table 13).

Table 13: Reasons for E-books or Printed Books Preferences

Preference	n	Percent	Reasons
Printed	225	65.98%	Easy to flip pages Sentimental value Improves learning and increases retention Clear font size and easy to read Eliminates distraction by other applications Healthier/ doesn't cause sight problems Comfort Writing notes on the book Not owning a proper device to access e-books No specific facilities needed such as a device, power, and internet connection Touchable Poor design or conversion of e-books Learning style preference Don't impose specific setting such setting on a table Credible Risk of losing e-books because of device failures Familiarity
E-books	60	17.60%	Convenience Ease to access Ease of navigation Search features and highlight tools Saving time and effort Environment friendly Copying content to use in other applications Flexibility Supported by multimedia for deeper understanding Scarcity of clean printed text books
No preference	56	16.42%	None of them is suitable to all subject areas Printed books for making notes and e-boos for searching features Each one serves a purpose Printed for learning/ more permanent use E-book for research/ temporary use Depends on availability Depends on ease of displaying and clarifying content Importance of content regardless of format

Another critical question for students was when they were asked to rate their overall experience using e-books provided by the college/program. Again the response was mixed. Over a third (38.13%) responded with a good

or very good rating, over a third (39.88%) with an average, poor, and very poor ratings, and nearly a third (21.99%) didn't know or respond (Table 14). When asked how important they feel instruction and training by their instructors is on the use of electronic resources in their studies, most students reported they feel that that it was either fairly important (44.19%) or very important (33.72%) (Table 15).

Table 14: Rating Experiences with E-books

E-book Experience Rating	n	Percent
Very Good	30	8.80%
Good	100	29.33%
Average	96	28.15%
Poor	28	8.21%
Very Poor	12	3.52%
N/A	75	21.99%

Table 15: Importance of Instructor Training/Instruction

Importance of Training/Instruction By Instructor on E-book Usage	n	Percent
Very Important	29	33.72%
Fairly Important	38	44.19%
Not Important	19	22.09%

Discussion

The present study aimed at identifying the uses and perceptions of e-books by students, particularly in academia, at Sultan Qaboos University. The discussion about e-books at SQU is timely as universities worldwide are often compelled to consider e-books as a viable replacement for print books (O'Hare & Smith, 2012; Lim & Hew, 2014; Mulholland & Bates, 2014,). There are convincing reasons why universities want to replace print books – ease-of-access, relevancy, convenience, search supports – which were also the most often cited reasons reported by SQU students in the survey. In addition, publishers point to the reality already experienced by SQU students as shown by this survey, which is students already use e-book in academia and many have positive experiences using them (Berg, Hoffmann, & Dawson, 2010; Grenina, 2012; Huang, Liang, Su, & Chen, 2012; Muir & Hawes, 2013). The pressure to use e-books will probably continue to increase at Sultan Qaboos University as it has at other universities, but some critical concerns raised by SQU students are worth considering.

The presence of e-book materials are already in class use with nearly half the SQU students reporting that instructors currently use e-book materials in their courses and the majority of students report their instructors recommend or actively encourage their use. If this practice of using electronic materials in courses is highly prevalent, it appears that the choice of format of the instructors' use is also highly varied. Students report that there is a wide spectrum of e-materials formats made available in their courses – from the simple pdf formatted text passages, to the multi-media supported, stand-alone e-books. This may account for, in part, why students appear to struggle to define e-books and continue to attribute wide variations of characteristics to them. The flexibility of defining e-books is consistent with students at other universities, due in part, to the wide types of usage that exists in their classes (Tedd, 2005; Bennett, 2006; Vassiliou & Rowley, 2008; McLure & Hoseth, 2012). As their presence becomes more commonplace on university campuses, there may develop a clearer consensus for the e-book definition.

In spite of their relative wide-spread use, most SQU students believe that it's important that faculty provide instruction and training on the use of e-books for their students. This suggests that many students perceive their use of e-books is somehow lacking or can possibly improve with the support of their instructors' guidance and training. Perhaps they imagine more can be done with these electronic formats that they may not be aware of doing. Perhaps some students have experienced more varied use in some classes. In any event, this perception by students highlights the need for university managers to plan and perhaps prepare faculty and students in their use before jumping on the e-book bandwagon.

As e-books are enthusiastically embraced as the next sustainable step for streamlining academic resources, the survey results highlight that students still prefer print books over e-books. Even in a technology-rich country such as Oman, students value the traditional printed paper books over the electronic format in both their academic and general use. Access, convenience, choices, familiarity, tradition – are most cited by students who prefer print books. Perhaps the ubiquitous connectivity issues on campus interfere with e-books access to be dependable enough for exclusive e-book use. Perhaps the lack of widely-available choices in Oman and in the Arabic language interferes with its extensive usage. Perhaps more importantly, is Oman's long standing tie to

written words and their sacred place in the culture that reinforces students' relationship with print books. What remains clear, however, is that Omani university students' preference to print is consistent with the results of studies elsewhere that shows the continued attachment university students have with print books (Woody & Baker, 2010; Rockinson-Szapkiw, Courduff, Carter & Bennett, 2012; Cumaoglu, Sacici, & Toron, 2013; Walton, 2014).

This strong relationship does not appear to be changing when looking ahead in time, even among 21st century Omani students. When asked to predict their future use, most SQU students envision a dual option of using both print and electronic in the future. The findings of this study concur with others (Gregory, C. 2008; Aaltonen, Mannonen, Nieminen, & Nieminen, 2011; Noor, Embong & Abdullah, 2012; Walton, 2014) that students are willing to make room for digital learning but are not willing to envision their future devoid of print books.

CONCLUSION

The results of this survey indicate that SQU students have diverse experiences with e-books and varying preferences for their format of classroom texts. These results corroborate with similar studies that stress students' unwillingness to exclude the text format from their studies. This survey provides only a partial view however, as these researchers prepare to survey SQU faculty and staff on e-books. The patterns identified in this study may change with additional feedback from other university stakeholders. Further investigation can be done, perhaps to look more closely at individual colleges and customize their needs more closely to their field goals and preferences. The purpose from this survey is to inform a sustainable solution for providing sound educational resources in the digital age and the need to refine our models when looking for those solutions. Perhaps a more comprehensive approach that provides variety and choice of formats is called for that better reflects the inclusive preferences of our digital age students and the changing nature of future textbook delivery systems.

REFERENCES

Abram, S. (2010), E-books part 2: trends and standards, *MultiMedia & Internet at Schools*, 17 (4), 24-27.

Armstrong, J., Lonsdale, R. & Nicholas, D. (2006), SuperBook: planning for the e-book revolution, *Library and Information Update*, 5 (11), 28-30.

Baki, A. (2010). E-book usage of graduate students studying educational sciences in Turkey. *Turkish Online Journal of Distance Education*, 11(1), 198 – 210.

Doering, T., Pereira, L. & Kuechler, L. (2012). The use of e-textbooks in higher education: A case study. *E-Leader Berlin*.

Gonzalez, R., Gasco, J. & Llopis, J (2014). ICT in higher education: an experience with e-books. *Applied Computer Science*, 10(1), 1-10.

Gregory, C. (2008). But I want a real book: An investigation of undergraduates' usage and attitudes toward electronic books. *Reference & User Services Quarterly*, 47(3), 266-273.

Jamali, H.R. Nicholas, D. & Rowlands, I. (2009). Results from the JISC National EBook Observatory. Aslib Proceeding: New Information Perspectives. 61 (1), 33-47.

Johnson, L., Levine, A., Smith, R., & Stone, S. (2010). *The 2010 Horizon Report*. Retreived from ERIC: http://eric.ed.gov/?id=ED510220

Kiriakova, M., Okamoto, K. S., Zubarev, M., & Gross, G. (2010). Aiming at a moving target: Pilot testing ebook readers in an urban academic library. *Computers in Libraries*, 30, 20–24.

Kossey, J. & Brown, V. (2011). Digital readers: An emerging technology in education. Proceedings of Society for Information Technology & Teacher Education International Conference.

Lam, P., Lam, J., & McNaught, C. (2010). How usable are eBooks in a mLearning environment? *International Journal of Continuing Engineering Education and Lifelong Learning*, 20, 6–20.

Letchumanana, M. &Tarmizib, R.A. (2010), Utilization of e-book among university mathematics students, *Procedia Social and Behavioral Sciences*, 8, 580-587.

Liaw, S.-S. & H.-M. Huang (2014). Investigating learner attitudes toward e-books as learning tools: based on the activity theory approach. *Interactive Learning Environments*, 1-19.

Lim, E. & Hew, K. (2014). Students' perceptions of usefulness of an e-book with annotative and sharing capabilities as a tool for learning: A case study. *Innovations in Education and Teaching International*, 51 (1), 34-35.

Muir, L. & Hawes, G. (2013). The case for e-book literacy: undergraduate students' experience with e-books for course work. *Journal of Academic Librarianship, 39(3)*, 260-274.

Mulholland, E. & Bates, J. (2014). Use and Perceptions of e-books by academic staff in further education. *The Journal of Academic Librarianship*, 40, 494-499.

Nelson, M. R. (2008). E-books in higher education: nearing the end of the era of hype? *Educause Review*, 43(2), 40.

Nicholas, A. & Lewis, J. (2008). Millennial attitudes toward books and e-books. Available at SSRN 2684872. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2684872

O'Hare, S. & Smith, A. (2012). The customer is always right? Resistance from college students to e-books as textbooks. *College of University Libraries Systems, 2,* 35-41.

Strother, E., Brunet, D., Bates, M. & Gallo, J. (2009). Dental students ' attitudes towards digital textbooks. *Journal of Dental Education*, 73, 1361–1365.

Sun, J., Flores, J. & Tanguma, J. (2012). E-Textbooks and students' learning experiences. *Decision Sciences Journal of Innovative Education,* 10 (1), 63-77.

Tripathi, M. & Jeevan, V. (2008). E-book subscription in a distance education institution: A case of Indira Gandhi National Open University, India. *Serials Review*, 34(2), 104–114.

Wiese, M. & Du Plessis, G. (2015). The battle of the e-textbook: Libraries' role in facilitating student acceptance and use of e-textbooks. *South African Journal of Libraries and Information Science*, 80 (2), 17- 26.

Wu, M. & Chen, S. (2011). Graduate students' usage of and attitudes towards e-textbooks: experiences from Taiwan. *Program: Electronic Library and Information Systems,* 45(3), 294-307.

Appendix

SQU Students Use and Perceptions of E-Books

Introduction:

Thank you for agreeing to take part in this important survey. We are currently considering the use of e-books in some of our programs throughout Sultan Qaboos University and would like your opinion to inform the process. We are seeking your input as to the perceived role of e-books and their current use in your college experience.

This survey should not take more than 4 – 5 minutes to complete. To begin, please click 'Next'.

1. Gender: Male Female

2. How many years have you been studying in SQU?
   1 2 3 4 5 6 7 more than 7

3. What is the degree that you will earn from your current studies in SQU?
   a. Diploma
   b. Bachelor
   c. Master
   d. PhD

4. Which College do you study in?
   a. Agriculture
   b. Arts and Social Studies
   c. Economy and Political Sciences
   d. Education
   e. Engineering
   f. Law
   g. Medicine
   h. Science
   i. Nursing

5. How do you rate your skills in using computer technologies? (including ipads and smart phones)
   Poor Average Good Excellent Expert

6. How often do you access the internet?
   Several times a day Daily Every couple Days Weekly Rarely

7. What is an e-book from your point of view?
   a. Preferred Choice 1: an electronic version of a printed book that can be read on a computer or handheld device designed specifically for this purpose
   b. Preferred Choice 2: a dedicated device for reading electronic versions of printed books.
   c. Preferred Choice 3: digitized text in pdf file format
   d. Preferred Choice 4: a digitally presented format of information with embedded enhancements that includes multimedia published by an authorized distributor.
   e. Preferred Choice 5: I would consider all of the above an e-book to me.
   f. Other:
   _____
   g. I don't know how to define an e-book.

8. Have you ever used an e-book?
   Yes No

If yes, please proceed to Q9. If no, please proceed to Q21.

9. For what purposes do you usually use e-books? (please tick all that apply)
   a. _____ In my classes for reading resources
   b. _____ In my classes for designing resources

c. _____ In my research
d. _____ Other areas of interest (Leisure)
e. _____ Others (state them: _____)

10. What are your sources of e-books? (please tick all that applies).
    a. _____ University e-library
    b. _____ University course materials
    c. _____ Social Networking Sites
    d. _____ Sharing applications
    e. _____ Moocs (free online courses) or other websites
    f. _____ ITunes U
    h. _____ Others (specify _____)

11. In a week, how long do you usually spend using e-books?
    a. less than 30 minutes
    b. 30 minutes–1 hour
    c. 1–2 hours
    d. 2–5 hours
    e. 5–10 hours
    f. 11+ hours

12. In a typical session, how long do you spend reading an e-book from the screen?
    a. less than 3 minutes
    b. 3–5 minutes
    c. 6–10 minutes
    d. 11–20 minutes
    e. 21+ minutes

13. How do you normally use e-books? (please tick all that applies):
    a. Browse through the chapters
    b. Read entire chapters
    c. Use the search tools to identify key words within the books
    d. Scan information quickly
    e. Search through the contents page
    f. Annotate (highlight) text that was useful
    g. Copy and paste text into MSWord or other computer software
    h. Print out pages to read in print

14. On a scale of 1–5 (1= lowest, 5= highest), how much do you depend on e-books for your learning/research?
    1 2 3 4 5

15. Does your instructor recommend or actively encourage you and your classmates to use e-book materials? (please tick all that applies):

    a. Yes, e-books are sometimes included in *Moodle/Blackboard* resources
    b. Yes, e-books are on my reading list or handouts
    c. Yes, e-books are included as course material
    d. No

16. What are the advantages of using e-books? (please tick all that applies):
    a. Ease of access — ability to access books anytime/anywhere (24/7)
    b. Usefulness of search tools and other available features
    c. Automatic referencing/citations
    d. Off campus access (remote access)
    e. Convenient/fast and easy
    f. Good range/selection of titles
    g. Others (specify_____)

17. What are the disadvantages of using e-books? (please tick all that applies):
    a. Discomfort/difficulty reading from the screen

b. Lack of choice of e-book titles for the subject areas relevant to my study area
c. Could not gain access off-campus
d. Lack of choice of e-book titles in Arabic
e. Pages take too long to navigate/too slow
f. No facility to have the text read out loud
g. Others (specify _____)

18. Thinking about the required texts required for learning your course(s), would you prefer to use an e-book or a printed book?

a. E-book
b. Printed book
c. No preference

19. In response to Q18, please use the space below to explain why you would prefer to use either an e-book or a printed book.

_____
_____
_____
_____
_____
_____

20. How would you rate your overall experience of using the e-books provided by your college/program?

a. Very good
b. Good
c. Average
d. Poor
e. Very poor
f. N/A

21. Only answer this question if you answer No to Question 8. Why have you not used e-books? (please tick all that applies):

a. Never knew about them
b. I prefer to use printed books
c. Had difficulty accessing them/couldn't find them
d. I find it difficult to read e-books from the screen
e. I was unaware of relevant titles for the subject I study

22. How important do you feel instruction/training by your instructor is on the use of electronic resources to your studies?

a. Very important
b. Fairly important
c. Not important

23. How do you envision the role of e-books in your life within 5 years' time?

a. For some books, I will prefer to read print books, for others I will prefer the e-book.
b. I will mostly read print books
c. I will mostly read e-books
d. I don't know

Why?

_____
_____
_____
_____

24. Please add any other comments you might have in relation to e-books.

_____
_____

Thank for participating in this survey.

Effects of Multimedia Task-Based Teaching and Learning Approach on EFL Learners' Accuracy, Fluency and Complexity of Oral Production

Madhubala BAVA HARJI
Faculty of Applied Communication, Multimedia University, Malaysia
madhu@mmu.edu.my

Mehrnaz GHEITANCHIAN
Lexicon Language Institute, Malaysia
mehrnazgh@yahoo.com

ABSTRACT
Albeit Task-Based Language Teaching (TBLT) has been extensively researched, there appears to be limited studies that focus on the effects of multimedia technology (MT) enhanced TBLT approach on EFL development. A study was conducted to examine the effects of a MT imbued TBLT, i.e. Multimedia Task-Based Teaching and Learning (MMTBLT) approach on EFL oral production. The Content Management System, a free web-based software program, was used as a platform to create the MMTBLT environment, where various instructional and supplementary materials and hyperlinks to other relevant web pages were incorporated to create a causal link between the real world language use and an EFL learning environment. Online lessons comprised tasks that were structured cluster of ideas to enable students to construct their own knowledge for oral production. Three broad thematic tasks, with four tasks at varying levels of complexity for each theme were carried out as treatment tasks. Upon completion of tasks under each theme, students carried out oral test tasks that were audio recorded for analysis. As a result of performing tasks of varying levels of complexity within a web-based multimedia platform setting, students' accuracy, fluency and complexity of oral EFL production improved significantly. Favourable outcomes suggest that EFL instructors could consider the MMTBLT approach and design web-based syllabus to complement language teaching.

INTRODUCTION
Since the 1980s, task-based language teaching (TBLT) has held a predominant position in the world of language pedagogy. It has gained popularity as a prominent instructional means through which learners effectively develop their second language (L2) (Lee, 2000; Bygate et al., 2001, Ellis, 2003; Nunan, 2013; East, 2012, Ellis & Shintani, 2013). Willis and Willis (2007, p.1) asserted, "… the most effective way to teach a language is by engaging learners in real language use in the classroom. This is done by designing tasks-discussions, problems, games, and so on-which require learners to use the language for themselves". Nunan (1989, p.10) defined task as "a piece of classroom work which involves learners in comprehending, manipulating, producing or interacting in the TARGET LANGUAGE while their attention is principally focused on meaning rather than form."
Nunan stressed on prioritising meaning over form in performing tasks. Ellis (2003, p16) added that

> "a task is intended to result in language use that bears a resemblance, direct or indirect, to the way language is used in the real world. Like other language activities, a task can engage productive or receptive, and oral or written skills, and also various cognitive processes".

With tasks considered as building blocks for language learning, and with claims made of the positive effects of TBLT, EFL researchers began examining tasks and their effects on EFL learners' language development from different perspectives (Bygate, Skehan, & Swain, 2001; Van den Branden, 2006).
L2 researchers also began looking at technology-enhanced teaching in various contexts and reported its positive effects on learners' learning outcomes (Neo & Neo, 2009; Boyer, Briggeman & Norwood, 2009; Bava Harji et al., 2010; Madhubala et al., 2014 Tsai, 2011; Almudibri, 2012). The introduction of technology into the TBLT context provides more resources for task performance and "encourages learners to exercise agency and enact identities" (Ortega, 2009, p.263). Literature on digital literacy highlights the importance of technology-mediated language teaching to foster learners' digital literacy development, which is pivotal in the 21st century era. However, despite the fact that TBLT is introduced as a "very powerful language pedagogy" (Van den Branden et al., 2009, p.1), there appears to be limited studies that focus on the effects of technology-enhanced TBLT approach on students' EFL development (Li & Ni, 2013). This paper presents the outcome of an attempt to imbue multimedia technology (MT) into TBLT.

LITERATURE REVIEW

According to Ellis and Shintani (2013, p.149), "probably the most ambitious attempt to formulate a theory of TBLT is Robinson's Cognition Hypothesis" (RCH). Robinson (2001, 2003, 2005) claimed that complex tasks promote more accurate and complex, though less fluent, output than simpler tasks. He believed that when EFL learners engage in carrying out a task, attention to different aspects of the task potentially enables them to enhance performance in all three areas of language production, namely, accuracy, fluency, and complexity. Robinson maintained that increasing cognitive demands of the task generates more interaction, more attention to form, and more intake of information from the input.

Taking into consideration his Cognition Hypothesis, Robinson (2007, 2011) proposed the Triadic Componential Framework (TCF) for EFL task classification. The three classifications are: (1) task complexity, (2) task condition, and (3) task difficulty. Firstly, task complexity refers to the cognitive demands of the task that can be manipulated along two key variables: "resource-directing" and "resource-dispersing". Resource-directing variables control the extent to which learners focus on specific linguistic forms; therefore, they affect the development of inter-language, EFL acquisition and automaticity. In contrast, "resource-dispersing" variables govern learners' memory resources, but their attention to linguistic forms; thus conversely, they do not affect inter-language development, and EFL acquisition and automaticity. Secondly, task conditions, which relate to the interactive demands of the task. Task conditions can be defined as tasks that are open or closed, one-way or two-way and convergent or divergent. Finally, task difficulty, which is concerned with cognitive factors, such as aptitude and working memory, as well as affective factors, such as motivation and anxiety that can help explain individual differences (Spilsbury, Stankov & Roberts, 1990; Robinson, 2001a, 2001b).

Robinson (2003, p.57) believed that task complexity should be "the major basis for proactive pedagogic task sequencing in task-based approaches to syllabus design" and argued that task complexity is "the result of the attentional memory, reasoning, and other information-processing demands imposed by the structure of the task on the language learner, and these are relatively fixed and invariant" (Robinson, 2001, p.28). Robinson outlined three factors, i.e. task complexity, task condition, and task difficulty in his TCF. According to Malicka and Levkina (2012), these factors interact and affect task performance, and possibly the interlanguage development. However, task complexity is the only variable, which can be manipulated intentionally to increase or decrease the cognitive loads on learners in order to elicit specific linguistic behavior (Robinson, 2007). Robinson and Gilabert (2007, p.162) noted that increasing cognitive demands of a task will "push learners to greater accuracy and complexity of EFL production".

Skehan (1998) maintained that performance of tasks can be assessed using three dimensions of language production based: accuracy, fluency, and complexity. He asserted that fluency requires learners to use their exemplar-based memory and that learners can attain accuracy and complexity of oral production by employing their rule-based memory. Skehan (1996, p.46) defined the three dimensions of EFL learners' speech as follows:

> "Accuracy is concerned with a learner's capacity to handle whatever level of interlanguage complexity s/he has currently attained. Complexity, and its attendant process restructuring, relates to the stage and elaboration of the underlying interlanguage system. Fluency, finally, concerns the learner's capacity to mobilize an interlanguage system to communicate meaning in real time."

Several studies examined have whether accuracy, fluency and complexity represent distinct features of language and different measures loaded on them (Skehan & Foster, 1997; Mehnert, 1998).

Saville-Troike (2012, p.80) maintained that "fluency is achieved in production […] through use of automated rule-based systems". Similarly, Schmidt (1992, pp.358-359 as cited in Bava Harji et al., 2014) referred fluency as "automatic procedural skill" that showed the speech which can be easily and automatically produced with no effort and attention (Wood, 2010). Foster and Skehan (1999) elaborated on these three dimensions and explained that accuracy is associated with conventionalism and in applying better structure and having more control on the uttered language; complexity succeeds in having less monitoring, but more tentative structure at the edge of the interlanguage; and fluency is associated with the ability to handle the communicative demands of the real environment, and presumably is more lexical-based.

MULTIMEDIA TASK BASED LANGUAGE TEACHING AND LEARNING

With studies reporting favourable outcomes of the TBLT approach on oral language production and with limited studies on multimedia technology (MT) based TBLT approach, a study incorporating Web-based MT into TBLT, i.e. termed as Multimedia Task Based Language Teaching and Learning **(**MMTBLT) approach was tested in an EFL context. The overarching aim was to examine the extent to which, with varying levels of task complexity, MMTBLT affects EFL learners' oral production. The study also examined the plausibility of

applying RCH, focusing on the effects of increasing task complexity along resource-directing dimension on Iranian EFL learners' oral production. Figure 1 illustrates the research design.

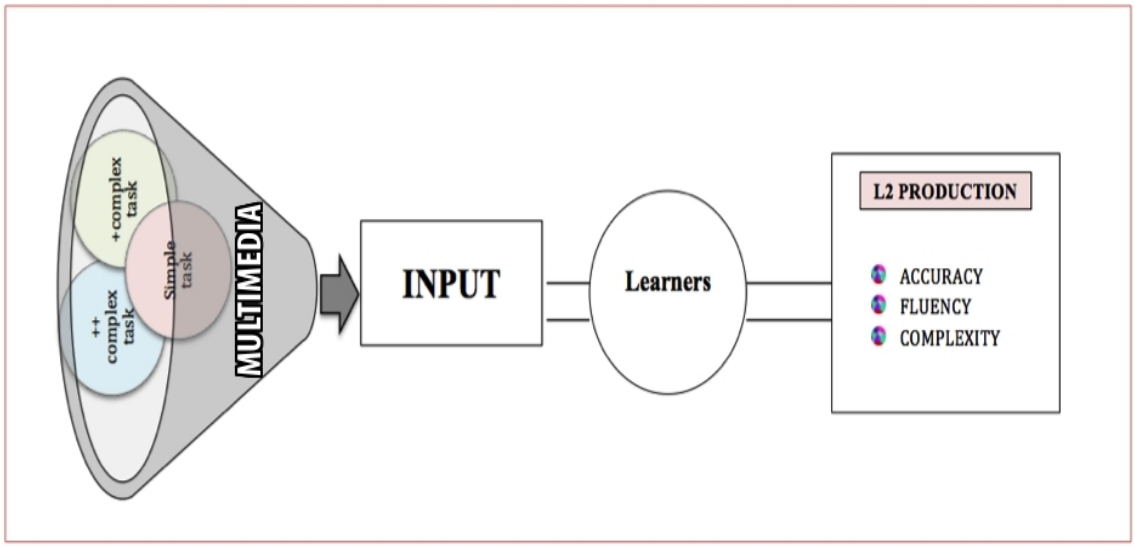


Figure 1: Research design

To provide a rich multimedia source, a web-page was set up for students to access a wide range of materials. It created a virtual EFL environment, which drew the students' attention, kept them involved in their learning process, and stirred them towards autonomous learning. The Content Management System (CMS), a free web based software programme, which is a blogging tool was used as a platform to create the MMTBLT environment. Various instructional materials, supplementary materials, hyperlinks to other relevant web pages, hypertext, images, visual, audio, video, games, self-assessment tests etc. were made available on this MMTBLT web-based context. All lessons, which were posted twice a week, comprised tasks that were structured clusters of ideas to help students construct their own knowledge for their oral productions in class. A link, which formed an avenue for virtual communication among fellow peers and the instructor, was also made available on the web-page. This kept students linked up and in constant communication with each other and with the instructor. They were able to post comments, queries and assignments as well as share their views on the link. Links to other websites opened up rich resources for authentic use of language as well as task performance.

As mentioned earlier, in testing RCH, three thematic topics, using Ellis and Shintani's (2013) guiding criteria for determining the thematic content of the tasks, i.e. topic familiarity, intrinsic interest and topic relevancy were designed. The three broad themes were: *Personal Life* (to enable students to kick start their oral presentations on more familiar topics that do not require external information, are less taxing on producing oral EFL sentences, which consequently aid in developing students' confidence), *Travel* (to enable the students to "step" forward and think beyond their personal lives, yet feel being connected to their previous theme) and *World Event* (to enable students to perform tasks that are based on events around them and possible events that they may encounter in real FL context). Adopting Robinson's TCF (2001, 2003, 2007) and Nunan's (2004) categorisation of task difficulties, four tasks under each themes were designed. See Bava Harji, Gheitanchian, & Letchumanan (2014) for more details of the study.

Table 1 presents the description of the tasks: types of tasks, resource-directing dimensions, levels of task complexity, treatment tasks and test tasks.

Table 1: Description of tasks

Phases (Themes)	Types of Tasks *(Nunan's Task Difficulty)*	Resource-directing dimensions *(Robinson's classification)*	Complexity levels	Description of tasks *(4 tasks per theme)*	Test tasks
Pre					Talk about self (Pre-test)
1	Static	+Here-and-now	Simple	Describe family members.	Tell a story

(Personal Life)				Describe a picture of a place. Describe a favourite place. Describe a favourite job.	with 'you' as the main character
2 (Travel)	Dynamic	-Here-and-now	+Complex	Travel in a city within the country. Travel within the country with an international friend. Travel abroad and book a room in a hotel. Attending an English program abroad.	Talk about a trip
3 (World Events)	Abstract	-Here-and-now - No reasoning	++Complex	Sharing an event in the university. Sharing an event in the city. Sharing an event in the country. Sharing an event in another country.	Talk about a critical piece of news

(Adapted from Bava Harji, Gheitanchian & Letchumanan, 2014)

This study was conducted over a 16 week period (four weeks per phase), inclusive of the pre-and post-test. As seen in Table 1, the students were required to carry out specific tasks of different levels difficult and complexity within the specific resource directing dimensions.

METHODOLOGY

Participants

57 adult Iranian EFL students (41 females, 16 males; 19 to 58 years) who were registered in a three-credit General English course required for their bachelor's degree at Islamic Azad University, Azadshahr campus in Iran, participated in the study. An interview with individual students prior to the study found that most of them had not participated in any English classes since high school and their oral language proficiency was limited to one or two word level. This could be due to the lesser emphasis on oral skills compared to grammar, reading and vocabulary, which are tested in the university written examination. The results of the students' oral presentation before the study (see Results section) affirms their limited oral proficiency skills.

Instruments

A total of 4 self-designed oral test tasks, inclusive of a pre-test task was used to examine the students' oral production. Both experienced EFL and ESL instructors, who has more than 15 years of teaching experience vetted the tests. As presented in Table 1, the students carried out the four test tasks, which were based on each theme after the completed performing the four tasks of varying levels of complexity under each theme. The pre-test was administered to gauge the students' oral production prior to the treatments.

Since consideration of various measures to evaluate accuracy, fluency, and complexity of EFL production makes cross study comparison complicated and does not lead to reliable results (Dembovskaya, 2009), measures which have been employed in previous studies (e.g. Mehnert, 1998; Foster & Skehan, 1996, 1999; Yuan & Ellis, 2003, 2005; Larsen-Freeman, 2006; Dembovskaya, 2009) and showed sensitivity in capturing useful variance were adopted. This study, thus, examined the effects of MMTBLT on the EFL students' oral production, i.e. in terms of the following specific measures:

a) accuracy: (i) error-free clauses (ii) verb tenses (iii) use of plurals
b) fluency: (i) words per 90 seconds (ii) number of pauses per 90 second
c) complexity: (i) clausal subordination (ii) use of conjunctions (iii) use of prepositions.

RESEARCH QUESTIONS

The following research questions are addressed in this paper:

1. What are the effects of MMTBLT approach, using varying levels of task complexity, on the accuracy of the students' oral EFL production, particularly in terms of:
   a) percentage of error-free clauses?
   b) target-like use of verb tenses?
   c) target-like use of plurals?
2. What are the effects of MMTBLT approach, using varying levels of task complexity, on the accuracy of the students' oral EFL production, particularly in terms of:
   a) number of words per 90 seconds?
   b) number of pauses per 90 second?

3. What are the effects of MMTBLT approach, using varying levels of task complexity, on the complexity of students' oral EFL production, particularly in terms of:
   a) amount of clausal subordination?
   b) frequency of use of conjunctions?
   c) frequency of use of prepositions?

ANALYSIS

The description of the analysis of the three dimensions are as follows:

1. Accuracy: Firstly, to acquire the "percentage of error-free clauses, the number of error-free clauses was divided by the total number of clauses and multiplied by 100" (Yuan & Ellis, 2003; Dembovskaya, 2009). Errors in syntax, morphology, and lexical choices were measured. As per Foster and Skehan (1996), and Dembovskaya (2009), lexical errors were measured when a word was absolutely wrong, but not in cases of fine appropriateness of a word in a sentence. For instance, the choice of word "beautiful" in the sentence "My brother is a beautiful man" was not considered as an error. Secondly, to examine target-like use of verb tenses in the students' utterances, the correct use of the verb tenses was measured (e.g. *My brother leave school at 1:00 pm every day*.; *We take a trip to Antalia last summer*.). Finally, to assess the number of target-like use of plurals, the correct use of plural nouns in the sentence (e.g. women not womans) and the subject-verb agreement (e.g. "My friend and I are [not am] talking about a trip now.") were counted.
2. Fluency: The number of trimmed words, which was counted referred to the deletion of words, which were repeated, self-corrected and addressed to the instructor. In terms of pauses, those that took two seconds or more were taken into account throughout the 90-second oral production.
3. Complexity: The number of clausal subordination was defined as the number of dependent clauses produced per 90 seconds. Any incomplete clauses or clauses with errors within the verb phrase boundaries were excluded from the count. Since the students were able to produce only short/simple sentences before the study, the frequency of use of conjunctions and prepositions were counted (See Result Section). The counting of the number of conjunctions and prepositions was thus deemed as an appropriate criterion to show any improvement in the students' ability to produce complex sentences.

A coding system was developed to ascertain reliability. Four independent raters individually coded the data and their levels of agreement were calculated for the eight measures, using Cohen's Kappa Coefficient. The results are presented in Table 2.

Table 2: Levels of Agreement between Raters

Dimensions	Measures	Kappa agreement values
Accuracy	Percentage of error-free clauses	1.000
	Target-like use of verb tenses	1.000
	Target-like use of plurals	0.833
Fluency	Number of words per minute	1.000
	Number of pauses per minute	0.839
Complexity	Amount of clausal subordination	0.808
	Frequency of use of conjunctions	1.000
	Frequency of use of prepositions	1.000

(Source: Bava Harji, Gheitanchian & Letchumanan, 2014)

As seen in Table 2, the interpretation of Kappa (Viera et al., 2005) shows that the levels of agreement among four raters were considered "very good". SPSS 16.0 was used for the statistical analysis of the coded data.

RESULTS

The multivariate statistical analysis was conducted for the eight measures. In addition the Duncan Multiple range test, followed by MANOVA repeated measure were run to examine the effects of the treatment tasks on the accuracy, fluency and complexity of the students' oral EFL production. The results of the data analysis are presented in answer to each of the research question.

Research Question 1: What are the effects of MMTBLT approach, using varying levels of task complexity, on the accuracy of the students' oral EFL production, particularly in terms of:

d) percentage of error-free clauses?
e) target-like use of verb tenses?
f) target-like use of plurals?

Percentage of Error-free Clauses

Table 3 presents the results of the effects of the treatment tasks on the students' oral production, in terms of *percentage of error-free clauses*.

Table 3: Duncan Multiple Range test results for error-free clauses

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-treatment		57	.0693			
1	simple	57		.2068		
2	+complex	57			.2567	
3	++complex	57				.3324
Sig.			1.000	1.000	1.000	1.000

As we can see in Table 3, the accuracy of students' oral production, in terms of the percentage of *error-free clauses* improved as a result of the treatment of varying levels of task complexity. Before the treatment, a mean score of less than .07 was recorded, but as the students underwent the three treatments of *simple*, *+complex* and *++complex* tasks, the mean scores gradual increased by approximately 0.14 (M=0.2068) after treatment 1, by 0.0499 (M_2=0.2567) and 0.0757 (M_3=0.3324) respectively after treatments 2 and 3. A significant difference in the mean scores was recorded after each treatment.

Target-like use of Verb Tenses

The results of the Duncan Multiple range test for the sub-measure of *target-like use of verb tenses* are presented in Table 4.

Table 4: Duncan Multiple Range test results for target-like use of verb tenses

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-Treatment		57	1.3158			
1	simple	57		3.9298		
2	+complex	57			4.9474	
3	++complex	57				6.4561
Sig.			1.000	1.000	1.000	1.000

Similar to the improvement in the students' ability to produce error free clauses, an improvement was also seen in their ability to produce *target like use of verb tenses*. The effects of the treatments were obvious with the onset of the very first treatment of simple tasks, i.e. a mean score of approximately 4 (MD=2.614). The students continued to improve in their production of *target-like use of verb tenses* after the second and third phases of the study. A mean difference of 5.1403 was found between the pre- and post-third treatment of ++ complex task. The increase in mean scores throughout the treatments was once again found to be significant.

Target-like Use of Plurals

Table 5 presents the results of the students' oral production of *target-like use of plurals* in their oral presentations.

Table 5: Duncan Multiple Range test results for target-like use of plurals

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-Treatment		57	.9123			
1	simple	57		3.1754		
2	+complex	57			3.7895	
3	++complex	57				5.6848
Sig.			1.000	1.000	1.000	1.000

Once again a significant difference is found in the mean scores before and after the first phase of treatment (M_0=0.9123<M_2=3.1754; *MD*=2.2417). Albeit, the improvement in producing *target-like use of plurals* was more obvious after the third treatment of ++complex task (M_3=5.6848) than after the second treatment. A more gradual improvement was after the first treatment. A mean difference of approximately 5 points (*MD*=4.8) was found between pre- and post-treatments.

Research Question 2: What are the effects of MMTBLT approach, using varying levels of task complexity, on the accuracy of the students' oral EFL production, particularly in terms of:

c) number of words per 90 seconds?

d) number of pauses per 90 second?

Number of words per 90 seconds

The results of the Duncan Multiple range test in Table 6 show that there was a significant progress in the students' ability to use the words they had acquired during the course of the study.

Table 6: Duncan Multiple Range test results for number of words per 90 seconds

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-Treatment		57	13.4035			
1	simple	57		23.7368		
2	+complex	57			37.4386	
3	++complex	57				60.8596
Sig.			1.000	1.000	1.000	1.000

The rising trends in the mean scores depicts the effects of the treatments on the fluency of the students' oral production, i.e. they were able to utter more English words. With increased levels of task complexity, i.e. from simple to ++ complex tasks, the students displayed evidence of improved vocabulary and increased number of words produced after each phase of treatments. A rather wide mean difference of 47.46 was recorded between the pre- and third treatments. Hence, it is obvious that the effects of the treatments were significant in enabling the students to produce more words per 90 seconds during their oral presentations.

Number of pauses per 90 seconds

As the students' ability to produce more words increased as seen earlier, they also displayed increased levels of confidence. As seen in Table 7, the mean scores for number of pauses (more than 2-3 seconds) counted in 90 seconds reflected a descending trend throughout the study.

Table 7: Duncan Multiple Range test results for number of pauses per 90 seconds

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-Treatment		57	7.1404			
1	simple	57		6.6140		
2	+complex	57			3.7895	
3	++complex	57				2.6316
Sig.			1.000	1.000	1.000	1.000

With the treatment of the varying levels of tasks and with their ability to produce more words, the students began to display more confidence. They were less hesitant and therefore consequently were gradually making less pauses which is reflected in the decline of the *number of pauses per 90 seconds*. The students initially paused

more often during the pre-test (*M*=7.1404), however, after the ++ complex task treatment, a significant difference in means scores (*MD*=4.51) is apparent.

Research Question 3: What are the effects of MMTBLT approach, using varying levels of task complexity, on the complexity of students' oral EFL production, particularly in terms of:

d) amount of clausal subordination?
e) frequency of use of conjunctions?
f) frequency of use of prepositions?

Amount of Clausal Subordination

Table 8 presents mean scores for the number *of clausal subordination* the students produced during their oral presentations. The improvement was clearly significant.

Table 8: Duncan Multiple Range test results for amount of clausal subordination

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-Treatment		57	2.000			
1	simple	57		5.4912		
2	+complex	57			6.9298	
3	++complex	57				11.1754
Sig.			1.000	1.000	1.000	1.000

The students' ability to produce more complex oral production was clearly once again evident in the study. They recorded a gradual increase in mean scores throughout the treatments. The students' ability to produce clausal subordination increased significantly after the very first treatment of simple tasks (*MD*=3.5). An even greater increase was found after the third treatment (M_0- M_3=9.1754).

Frequency of Use of Conjunctions

The students' *frequency of use of conjunctions* was also found to increase as a result of the treatments, albeit the increase was more gradual after the first treatment phase.

Table 9: Duncan Multiple Range test results for frequency of use of conjunctions

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-treatment		57	.1228			
1	simple	57		.2982		
2	+complex	57			1.2807	
3	++complex	57				6.1228
Sig.			1.000	1.000	1.000	1.000

The students were using more *conjunctions* after the treatment of ++ complex task than after the treatments of simple and +complex tasks. This is seen in the wider difference in mean scores between the pre- and post-third treatments ($M_{0=}$.1228; $M_{3=}$6.1228; *MD*=6), than between the first and second treatments (M_1=0.2982; M_2=1.2807; *MD* = .9825).

Frequency of Use of Prepositions

Table 10 presents the mean scores for the *frequency of use of prepositions.* Similar to the other measures, significant differences were found after each phase of the treatments.

Table 10: Duncan Multiple Range test results for frequency of use of prepositions

Treatment Phases	Types of Treatment Tasks	N	Subsets			
			1	2	3	4
Pre-Treatment		57	.1579			
1	simple	57		.3158		
2	+complex	57			.5789	
3	++complex	57				4.3509
Sig.			1.000	1.000	1.000	1.000

The students appeared to take a longer time to be more confident to frequently use prepositions. As seen in Table 10, mean scores of less than 1 point were recorded after treatments 1 and 2. The students were using prepositions less frequently in these two phases. However, a significant improvement in mean scores was found after performing ++ complex tasks. They clearly were using *of prepositions* more frequently (M_0-M_3=4.1930).

CONCLUSION

The findings of this study clearly showed positive effects of the MMTBLT approach on the students' oral production. The students were able to produce more accurate, more fluent, and more complex language output within 16 weeks of treatments. Increasing the degree of complexity of tasks along resource-directing dimension and using a web-based multimedia platform as a means of the MMTBLT approach resulted in improved levels of oral EFL productions. A closer examination of the results found that, albeit, significant improvements were found in the accuracy, fluency and complexity of the students' oral production between the pre- and post-tests, improvements were obvious in the production accuracy of *target-like use of verb tenses* (*MD*=5.14) and *target-like use of plurals* (*MD*=4.77) compared to *percentage of error-free clauses* (*MD*=0.26). The increase in the *number of word per 90 seconds* (*MD*=47.46) and the decrease in *number of pauses per 90 seconds* (*MD*=4.50) affirmed the students' improvement in their fluency of their foreign language. As for the production of complex sentences, the increase is greater for the *amount of clausal subordination* (*MD*=9.17), followed by the *frequency of use of conjunctions* (*MD*=6.0) and the *frequency of use of prepositions* (*MD*=4.19). In comparison, of the eight measures, the most obvious improvements were in the *number of words produced per 90 seconds*, followed by the *amount of clausal subordination.* However, relatively lesser levels of improvements were found in the students' ability to use *prepositions* and produce *error free clauses.*

The results of this study partially support Robinson's Cognitive Hypothesis as increased degree of task complexity along resource-directing dimension improved all three dimensions of the students' EFL oral production, particularly in the measures examined in this study. The results, which was conducted in an EFL context affirms the flexibility of the TBLT approach. The results were consistent with what Ellis (2009) mentioned as one of the strengths of this approach, i.e., meaning is prioritised over form. This study had extended the TBLT approach by imbuing MT into TBLT and found that the web-based multimedia platform aided in creating a causal link between the real world language use and an EFL learning environment that clearly attributed to improved oral production.

With positive outcomes in favour of MMTBLT, EFL instructors could consider MT imbued TBLT approach and design web-based syllabus to complement the language teaching delivery. Real world events can be manipulated into tasks can also aid in sustaining students' interest as well as motivating them to learn FL.

REFERENCES

Almudibri, K. (2012). The Effectiveness of a CALL Multimedia Classroom on EFL Learners' Achievements, Attitudes and the Word Solving Strategies' Frequencies and the Perceptions of Helpfulness, when Compared with Learners in Traditional Classrooms: A Quasi-Experimental Study. Doctoral thesis, Durham University.

Bava Harji, M., Woods, P.C., Zhinoos Kamal Alavi, M (2010). The Effect of Viewing Subtitled Videos on Vocabulary Learning. *Journal of College Teaching & Learning, 7*(9). 37-42.

Bava Harji, M., Gheitanchian, M., & Letchumanan, K. (2014). The Effects of Multimedia Task-Based Language Teaching on EFL Learners' Oral EFL Production. *English Language Teaching*, *7*(4). 11-24).

Boyer, T., Briggeman, B., and Norwood, B. (2009). Demand for Multimedia in the Classroom. *Journal of Agricultural and Applied Economics*. *41*(3):791-808. doi: 10.1017/S1074070800003229.

Bygate, M., Skehan, P. & Swain, M. (2001). *Researching Pedagogical Tasks: Second Language Learning, Teaching and Testing*. Harlow: Longman.

Dembovskaya, S. B. (2009). *Task-Based Instruction: The Effect of Motivational and Cognitive Pre-Tasks on Second Language Oral French Production*. PhD dissertation, University of Iowa. Retrieved February 2012 from http://ir.uiowa.edu/etd/231/.

Ellis, R. (2003). *Task-Based Language Learning and Teaching*. Oxford: Oxford University Press.

Ellis, R. & Shintani, N. (2013). *Exploring Language Pedagogy through Second Language Acquisition Research*. Routledge. NY.

Foster, P. & Skehan, P. (1996). The Influence of Planning and Task Type on Second Language Performance. *Studies in Second Language Acquisition*, 18. 299-323.

Foster, P. & Skehan, P. (1999). The Influence of Planning and Focus on Planning on Task-Based Performance. *Language Teaching Research*, *3*(3). 215-247.

Lee, J. (2000). *Tasks and Communicating in Language Classroom*. Boston: McGraw Hills. Global Education Holdings.

Li, G. & Ni, X. (2013). Effects of a Technology-Enriched, Task-Based Language Teaching Curriculum on Chinese Elementary Students' Achievement in English as a Foreign Language. *International Journal of Computer-*
Assisted Language Learning and Teaching, *3*(1), 33-49.
Madhubala, B. H., Zhinoos K. A. & Krishnaveni L. (2014). Captioned Instructional Video: Effects on Content Comprehension, Vocabulary Acquisition and Language Proficiency. *English Language Teaching*, *7*(5); 2014.
Malicka, A. & Levkina, M. (2012). Measuring Task Complexity: Does EFL Proficiency Matter? In A. Shehadeh & C. Coombe (Eds.). *Task-Based Language Teaching in Foreign Language Contexts: Research and Implementation*. Amsterdam: John Benjamins.
Mehnert, U. (1998). The Effects of Different Lengths of Time for Planning on Second Language Performance. *Studies in Second Language Acquisition, 20*. 83-108.
Neo, M. & Neo, T.K. (2009). Engaging Students in Multimedia-Mediated Constructivist Learning-Students' Perceptions. *Journal of Educational Technology and Society 12*(2), 192-233.
Nunan, D. (2004). *Task-Based Language Teaching*. Cambridge: Cambridge University Press.
Nunan, D. (2013). *Learner-Centered Language Education: The Selected Work of David Nunan*. Routledge. NY.
Ortega, L. (2009, September 13-16). Task and Technology in Language Learning: Elective Affinities and (dis) ecounters. Plenary Delivered at the 3rd International Task-Based Language Teaching Conference. Lancaster, UK.
Robinson, P. (2001a). Task Complexity, Task Difficulty and Task Production: Exploring Interactions in a Componential Framework. *Applied Linguistics, 22*(1). 27-57.
Robinson, P. (2001b). Task Complexity, Cognitive Resources, and Syllabus Design: A Triadic Framework for Examining Task Influences on SLA. In P. Robinson (Ed.), C*ognition and Second Language Instruction* 285-316. Cambridge: Cambridge University Press.
Robinson, P. (2003). Attention and Memory during SLA. In Doughty, C. & Long, M. (eds), *The Handbook of Second Language Acquisition*, pp.631-78. Molden, MA; Blackwell.
Robinson, P. (2005). Cognitive complexity and Task Sequencing: A Review of Studies in a Componential Framework for Second Language Task Design. *International Review of Applied Linguistics in Language Teachi*ng. *43*(1). 1-33.
Robinson, P. (2007). Task Complexity, Theory of Mind and Intentional Reasoning: Effects on EFL Speech Production, Interaction, Uptake and Perceptions of Task Difficulty. *IRAL, 45*, 193-213.
Robinson, P. & Gilabert, R. (2013). Task-Based Learning: Cognitive Underpinnings. In Chapelle, C.A. (ed.) *The Encyclopedia of Applied Linguistics*. Blackwell Publishing Ltd.
Saville-Troike, M. (2012). *Introducing Second Language Acquisition*. Cambridge: Cambridge University Press.
Skehan, P. (1996). A Framework for the Implementation of Task-Based Instruction. *Applied Linguistics*, *17*(1), 38-62.
Skehan, P. (1998). *A Cognitive Approach to Language Learning*. Oxford: Oxford University Press.
Skehan, P. & Foster, P. (1997). Task Type and Task Processing Conditions as Influences on Foreign Language Performance. *Language Teaching Research. 1*(3).185-211.
Schmidt, R. (1992). Psychological Mechanisms Underlying Second Language Fluency. *Studies in Second Language*
Acquisition. 14. 357-85.
Spilsbury, G., Stankov, L. & Roberts, R. (1990). The Effects of Task's Difficulty on its Correlation with Intelligence, Personality and Individual Differences, 11, 1069-1077.
Tsai, S.C (2011). Multimedia Courseware Development for World Heritage Sites and Its Trial Integration into Instruction in Higher Technical Education. *Australasian Journal of Educational Technology*, 27(7), 1171-1189. Retrieved January 2012 from https://ajet.org.au/index.php/AJET/article/view/911/188
Van den Branden (ed.), *Task-Based Language Education, from Theory to Practice*. Cambridge: Cambridge University Press.
Van den Branden, K., Bygate, M., & Norris, J. M. (2009). *Task-Based Language Teaching*. John Benjamins B.V. USA.
Willis, D. & Willis, J. (2007). *Doing Task-based Teaching*. Oxford: Oxford University Press.
Yuan, F. & Ellis, R. (2003). The Effects of Pre-Task Planning and On-Line Planning on Fluency, Complexity and Accuracy in Oral EFL oral production. *Applied Linguistics*. *24*(1), 1-27.

Factors Influencing Undergraduates Attitudes towards ICT: An Empirical Study in Kheis

Dr. Alyya Meerza
Cardiff Metropolitan University
researcherq8@hotmail.com

Professor Gary Beauchamp
Cardiff School of Education, Cardiff Metropolitan

ABSTRACT
The increasing use of information and communication technology (ICT) in higher education has been explored largely in relation to undergraduate's attitude towards the usage of ICT in the universities. However, the success of ICT in any learning institution including Higher Education Institutions (HEIs) depends on the attitudes of undergraduates towards using ICT in their daily learning. Therefore, this paper aimed to investigate the critical factors that impact undergraduates use of ICT in learning at Kuwait universities. The Technology Acceptance Model (TAM) was applied to reach the aim of the study.

A sample of 717 undergraduates was selected from a public and a private university in Kuwait. The critical factors examined in this study are the type of university, language of learning and ICT support. Mixed methods such as quantitative and qualitative methods were conducted for the data collection.

The quantitative results suggested that the Usefulness of ICT and Ease of use of ICT factors are the key dimensions of undergraduates' attitudes towards ICT. Another result showed that the examined factors have had a direct impact on undergraduates' attitudes. Moreover, the qualitative results suggested the factor of peer learning had a strong impact on undergraduates' attitudes towards the use of ICT.

Keywords: ICT, undergraduates attitudes, TAM, Type of university, Language of learning, ICT support, peer learning, Kuwait universities.

INTRODUCTION

Integrating ICT into education and the intention of achieving a positive influencing of the quality of teaching as well as learning is evolving rapidly over the past two decades (Agbo, 2015). However, despite the high standards of living within Kuwait, the country severely lags behind other countries because of its relatively low innovation and productivity capabilities. So, recently there has been an emerging trend devoting an increasing amount of pressure on educational organizations to use ICT to improve their capacity in order to respond to learning needs (Alkharang & Ghinea, 2013).

It has been asserted by Williams (2003), that undergraduates who use ICT were found achieving better results in communication, cooperation and problem solving in learning. Graff (2003) and Mikropoulos et al. (2003) further claimed that the use of ICT supports the improvement of undergraduate's mental and creative activities. Most importantly, in a study conducted by Kreisel (2003) reported that undergraduates themselves were highly ranked in using animations software, visual design and design software. Moreover, Sife et al. (2007) point out that any technological change in educational practice necessitates the development of positive user attitudes toward the new technology.

A majority of the literature reviewed, directed towards a significant association between undergraduates positive attitudes and successful ICT integration. Rhoda and Gerald (2000) revealed that positive attitude towards ICT is widely recognized as a necessary condition for effective ICT use in learning. Moreover, for further support to the association between attitudes and the effective use of ICT, a study by Becta (2004) demonstrated that undergraduates' negative attitudes served as a barrier towards their use of ICT in learning. Selwen(2003) believed that undergraduates attitude towards ICT is influenced by several factors, and these factors could be unpredictable or irregular among different HEIs.

Ever since the integration of ICT into the educational sector, several studies have tried to explore factors that influence its successful implementation. Undergraduates' attitudes, being a significant determinant, as noted

above, have gained significance in such studies. The attitudes of undergraduates towards the use of ICT in learning, in turn, depend on various factors (Khan, Hasan and Clement, 2012). In Kuwait, types of Universities, i.e., public or private, differ considerably in terms of their physical features, technological availability and advancements, policy implications, etc. These differences can further affect the attitudes of their undergraduates towards the use of ICT in their daily learning.

Another factor has been arising with the appearance of different private universities in Kuwait; this factor is the language of learning. Since Arabic language consider being the first language for Kuwait, and it is adopted as the language of learning in public institutions in most of its departments, whereas the English language is popularly used as the basic language of learning in the private institutions. The inability of undergraduates to understand and fully adapt to English can severely hamper their e-learning process. This can further have an impact on their attitudes towards a particular technological change as well as to the use of ICT in their daily learning.

Moreover, a crucial factor affecting undergraduates' attitudes in HEIs is the ICT support that undergraduates receive at their respective universities. This support could be in the form of encouragement given by their tutors when using the technology. Another support is the extent of ICT availability at the institution that increases the usage of ICT by undergraduates.

This paper aims to investigate the critical factors that influence undergraduates' attitudes towards using ICT in learning at KHEIs. The study focused on three critical institutional factors, namely, the type of university, language of learning and the ICT support available.

RESEARCH QUESTIONS

1. Does the type of university influence undergraduates' attitudes towards using ICT at KHEIs?
2. Does the language of learning influence undergraduate's attitudes towards using ICT at KHEIs?
3. Does the ICT support influence undergraduates' attitudes towards using ICT at KHEIs?

LITRETURE REVIEW

Selim (2007) found that factors such as instructor & undergraduate characteristics, technology, and technical support are crucial determinants of the ICT success. Brummelhuis (1995) proposed that the researcher must identify influencing factors continually over the different phases of development since these variables are asserted to have a varying impact during all stages of innovation process of ICT usage in learning (cited in Agbo, 2015).

ICT usage in higher educational institutions, is concerned not only with the evolution in hardware and software, but also a wide range of extensions, such as actual accessibility to ICT, interactive learning, communication, instructional delivery enhancement, etc. (Dias & Atkinson, 2001). The present study has focused on the following three influential factors determining undergraduate's attitudes towards ICT in learning, particularly in KHEIs.

Type of university

Kuwait's Higher Educational sector comprises of private as well as public institutions. There have been studies that have shown that these two sectors differ drastically regarding their cultures, availability of ICT, quality of ICT, the language of learning, availability of internet for studying, etc. (Aldoub and Goodwin, 2007). They further claimed that the language of learning being Arabic in the public institutions, and English at the private ones, gives rise to varied attitudes in undergraduates towards their perceived advantages gained from ICT usage in their respective universities.

Another significant difference between the two kinds of universities relates to undergraduates access to the internet at their home, and their resultant attitudes. This is majorly due to the restricted access at their place of study. In the private sector, it can be assumed that undergraduates have access to the Internet at their institutions as well as home, and thus their preferred way of accessing the e-learning materials is via the Internet or Web. However, in comparison, the public sector undergraduates prefer CD/DVD, external resources, and personal computers in the laboratory, due to lack of access to the internet or wireless network at the institution (Doub, Goodwin & Hunaiyyan, 2008). The difference that this varied access brings about is, in the attitudes of undergraduates due to the differences in ease of usage of ICT.

Language of learning

In the study conducted by Alkharang & Ghinea (2013), among the higher educational undergraduates , the authors found out that 60% of their interviewees reported Language barriers as the most discouraging factor for

adopting ICT in their everyday learning. They further stated that English being the only language adopted for any e-content, serves as a significant barrier. Ali & Magalhaes (2008) also identified the language of learning, being a major hindrance to the adoption of the technology in its most benign form by the undergraduates. Bernárdez (2003) recognized language problems as a personal issue in the adoption of ICT, along with time management issues, and undergraduates' attitude towards learning styles or preferences.

It is interesting to note the study findings of Doub, Goodwin & Hunaiyyan (2008), among the undergraduates at College of Business Studies (CBS), a government institution, and the Gulf University for Science and Technology (GUST), a private institution, for the effect of language of learning on the undergraduates' attitudes towards ICT. The results reported that 50% of undergraduates at the public institution supported the adoption of ICT, only if it was available in Arabic, their first language.

ICT support

The ICT support provided to undergraduates during their learning in HEIs consider an important factor for the success of ICT during its implementation in Higher Education institutions. According to Warschauer (1998), tutors occupy a top position in enhancing undergraduates' motivation (Liu, 2009). Poor preparation, poor instructor awareness and training in using e-learning facilities, availability of fewer connections, slow downloads, etc. can affect the use of e-learning services, and eventually discourage undergraduates from using e-learning (Doub, Goodwin, & Hunaiyyan, 2008).

Hence, it has rightly been argued that adequate technical support is an important part of the implementation and integration of ICT in an education system (Rhema et al., 2013; Sife et al., 2007). Various literatures have brought forward numerous of ICT support which affects the undergraduates' interests and attitudes towards incorporating ICT in their learning. Rhema & Miliszewska (2010), in their study, reported that the Libyan higher institutions lack the access to adequate network facilities. Also, the study revealed that technical support was almost unavailable, resulting in delays in installation, operation, and maintenance of equipment. The authors argued that these hindrances regarding the ICT support severely discouraged undergraduates to use ICT in learning at their universities.

A few studies have also indicated that the above mentioned three influential factors can be inter-related. The study conducted by Liu (2009), as opposed to its earlier studies, found out no correlation between the ICT competence and the respective attitudes of the undergraduates. The explanation put forward by the author, who pointed out that to test this relationship, it is a must to consider the effect of the language of learning, rather than a mere involvement of level of technological adoption, in the first place. Moreover, Rhema et al. (2013) in their study on Libyan HEIs, found that the reason for a limited use of educational software within institutions was the non-availability of products in the market using Arabic as their language of learning.

RESEARCH METHODOLOY

The study was carried out in Kuwait universities, one public university and one private university. The sample of the study consists of a total of 717 undergraduates from the first year and final year of study, the sample was collected from three different academic departments of both universities, and they are the department of Computer science, the department of computer Engineering and Administration science department. Mixed method was used for the data collection, quantitative and quantitative approaches were applied for data gathering. A structured questionnaire was distributed to the sample, and only 717 were completed and delivered. Moreover, 17 participants from the same sample accepted to be interviewed. The distributed questionnaire was constructed on the basis of previous ICT literature, this study had benefited from Edmunds, Thorp and Conole (2012) and Davis (1986) studies by adapting some of their questions to fit the study objectives.

The questionnaire of the study was constructed in to two parts; the first part consists of demographic questions about type of university, the main language of learning and the ICT support received. Part two of questionnaire consists of 20 paragraphs related to TAM variables and the attitude variable. For measuring the attitude, a 5-point Likert scale was used to give participants the choice to select one answer for each paragraph (McLeod, 2008). Moreover, to ensure the reliability and the consistency of the constructed questionnaire before conducting the actual study, Cronbach's Alpha was measured and showed .941 which is acceptable.

TECHNOLOGY ACCAPTANCE MODEL (TAM)

Technology Acceptance Model (TAM) was used to reveal individual's attitudes and their actual use of technology [see Figure 1]. It is used to provide an explanation of the determinants of computer acceptance that is Due to the ability and simplicity of the framework for understanding individual's attitudes towards technology. TAM and its extensions have been widely used in numerous researches conducted on ICT (King and He, 2006).

Therefore, the original TAM model was chosen as the basic framework for the present study, as each of its components is similar to what is aimed at in the study undertaken. However, the factors investigated to their relation to undergraduates' attitudes towards the use of ICT, considered the external factors of TAM in this study.

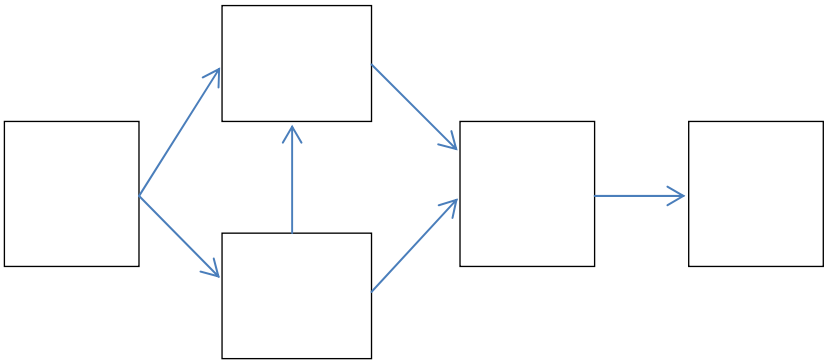


Figure 1: Technology Acceptance Model (TAM), Davis (1986)

RESULTS

The quantitative data gathered from the sample of the study at both private and public KHEIs have been tabulated and analysed. Also the qualitative data obtained from the interviews with undergraduates was analysed using the NVIVO software. It is noted that the results obtained from both the quantitative and qualitative analysis are in sync with each other.

Type of university factor

To understand whether the type of university influences the undergraduates' attitudes towards using ICT at KHEIs, T-test has been used to analyse the responses of undergraduates of both universities (private and public). Table 1 shows the means and standard deviations of the responses of undergraduates. According to the results, all T values appear significant at the level $\alpha < 0.01$. However, undergraduates of public university have a higher means as compared to the private counterparts, with respect to usefulness, ease of use and general attitude towards ICT learning.

Table 1: Means and standard deviations of the participants' responses towards ICT

Content of the attitude	public (457=n)		private (260=n)		T	P value
	Mean	SD	Mean	SD		
Ease of use	4.37	0.51	4.25	0.56	2.832	**0.005**
Usefulness	4.31	0.55	4.16	0.65	3.427	**0.001**
General attitudes	4.34	0.49	4.21	0.57	3.366	**0.001**

Language of learning factor

To understand whether the language of learning influences the undergraduate's attitudes towards using ICT at KHEIs or not, the means and standard deviations of the responses of undergraduates from both public and private universities to using ICT were analysed with regard to the different languages of study The mean of participants' responses from amongst undergraduates at both universities studying through the medium of the English language to the 'ease of use', 'usefulness' and 'general attitudes' is higher than for the responses of those studying in both Arabic and English in both universities [see Table 2].

Table 2: Means and standard deviations of participants' responses towards ICT, regarding differences in the language of learning

Content of attitudes	Arabic (n = 17)				English (n = 431)				Arabic & English (n = 269)			
	pubic (n = 13)		private (n = 4)		public (n = 212)		private (n = 219)		public (n = 232)		Private (n = 37)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Ease of use	4.21	0.54	4.45	0.47	4.39	0.51	4.29	0.53	4.36	0.51	4.05	0.71
Usefulness	3.96	0.77	4.03	0.67	4.34	0.54	4.19	0.62	4.31	0.54	3.93	0.80
General attitudes	4.09	0.64	4.24	0.43	4.36	0.49	4.24	0.53	4.34	0.49	3.99	0.73

ICT support factor

To understand whether the ICT support influences the undergraduate's attitudes towards using ICT at KHEIs or not, the means and standard deviations of the responses of undergraduates from both public and private universities towards using ICT, and towards the component of attitudes were calculated with regard to differences in ICT support, as shown in Table 4. The mean of participants' responses from undergraduates at the public university to 'usefulness', 'ease of use', and 'general attitudes' is higher than for the responses from the private university undergraduates. Table 3 shows the results of analysing this question.

Table 3: Means and standard deviations of participants' responses towards ICT, regarding differences in ICT support

Content of attitude	AgreeStrongly agree - (n = 515)						Neutral (n = 119)						Disagree - Strongly disagree (n = 83)					
	KU (n= 330)		AUK (n=185)		Total (n =515)		KU (n = 57)		AUK (n = 62)		Total (n =119)		KU (n=70)		AUK (n=13)		Total (n= 83)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Ease of use	4.43	0.46	4.32	0.51	4.39	0.47	4.24	0.56	4.14	0.60	4.19	0.58	4.19	0.64	3.82	0.78	4.14	0.67
Usefulness	4.37	0.50	4.23	0.61	4.32	0.55	4.19	0.58	4.03	0.69	4.10	0.64	4.13	0.69	3.69	0.73	4.06	0.71
General attitude	4.40	0.44	4.28	0.53	4.36	0.48	4.22	0.53	4.08	0.60	4.15	0.57	4.16	0.64	3.76	0.71	4.09	0.66

DISCUSSION

The discussion section elaborately presents the entire study. The focus of this study is to identify the critical factors that influence undergraduate's attitudes towards using ICT in learning at Kuwait Higher Education Institutions (KHEIs).

Impact of type of university factor on undergraduates attitudes towards ICT

As per the results, there is a significant difference between the attitude of undergraduates of private university towards ICT and the attitudes of undergraduates of public university towards ICT. The average general attitudes, ease of use and usefulness towards using ICT amongst undergraduates at the public university amounted to 4.34, 4.37 and 4.31 respectively. On the other hand, the average of general attitudes of the ease of use and usefulness factors for undergraduates at the private university amounted to 4.21, 4.25 and 4.16 respectively. This indicates that the undergraduates ' attitudes at the public university towards using ICT are strongly positive than those at the private university. When projected onto the TAM framework, the results related to this question harmonize with what has been expected. Also, the qualitative results obtained from the interviews with the undergraduates of both the universities, it was observed that all the undergraduates agreed on the usefulness of ICT. The results also indicated that the public university conducted training courses and workshops by implementing ICT in learning processes. This encouraged the undergraduates and facilitated their positive attitude towards using ICT.

Selwyn, Potter & Cranmer (2009) stated in their research that undergraduates ' attitudes towards using ICT is highly influenced by school's authority and provisions adopted by them. Their study revealed that the educational use of ICT depends on the nature of schools. The results of the current study is consistent with the previous researches as it is discovered here, that the usage of ICT is promoted in the public universities and not in the private universities in Kuwait that affects the attitude of undergraduates .

Impact of language of learning factor on undergraduates attitudes towards ICT

As per the results, it is observed that the language of study has a positive impact on the undergraduates' attitudes towards using ICT. It is found that the undergraduates (of both public and private) learning through English language alone have more positive attitude towards using ICT than those undergraduates studying Arabic or both the languages. The most positive mean value of general attitudes, ease of use and usefulness are for undergraduates studying English at the public university. As for the qualitative analysis, the results indicated that undergraduates do not consider the English language as a barrier to using ICT in their studies. Also, it was observed that using ICT for educational purposes enhanced the language skills of the undergraduates of both the universities.

According to Doub, Goodwin & Hunaiyyan (2008) conducted their research to understand the role of language in the usage of ICT among the undergraduates. The study revealed that 50% of the undergraduates supported the adoption of ICT, only if it is made available to them in Arabic, their first language. Hoque and Alam (2010)

stated that the international language of ICT is English. Therefore, the lack of skills in this language amongst undergraduates is considered as an obstacle to the use of ICT in learning. The results of the current study are consistent with the previous studies as English language is considered as the international language of ICT which affects the attitudes of undergraduates in the positive way or negative way, depending upon the language knowledge of the undergraduates.

Impact of ICT support factor on undergraduates attitudes towards ICT

As per the results, it is observed that ICT support factor has a positive impact on the undergraduates ' attitudes towards using ICT in learning. The mean value of undergraduate's (of public university) "agreement" with respect to ICT support and its influence on their general attitudes, ease of use and usefulness were found to be 4.40, 4.43 and 4.37 respectively which is the highest as compared to "disagreement" and "neutral". In case of undergraduates of private university, the mean value of "agreement" was the highest. The results clearly indicate that the attitudes of individuals are influenced by the ICT support which is in alignment with the TAM framework. Also, the interviews indicated that the public university undergraduates received support for ICT use from the tutors and their friends within the university. With respect to the private university undergraduates, the results indicated that undergraduates receive limited ICT support from their tutors and communicate with them solely via the university email service, and then only during working hours.

According to Fu (2013) and Selwyn, Potter & Cranmer (2009), ICT support from educational institutes is the most significant and fundamental external factors in influencing undergraduates attitudes and their use of ICT in learning. The attitudes of tutors and their beliefs on ICT use highly impacts the attitudes of undergraduates. The support factor provided from the tutors as well as parents highly contributes to the formation of positive attitudes of undergraduates towards using ICT. As the results of this study are in alignment with the discoveries of previous studies, the implications of this research are justified.

CONCLUSSION

The integration of ICT in education is considered as an asset for encouraging technological growth. Its use not only changes the traditional ways of teaching, but also requires tutors to be more creative in adapting and customizing their own teaching materials and strategies for encouraging undergraduates to adapt this new form of learning. The success of ICT in any learning institution including the KHEIs depends on the attitudes of undergraduates towards using ICT in their daily learning process. For this purpose, it is essential to understand that what factors may influence the usage of ICT among the undergraduates. In this paper, the factors such as the type of universities, the language of study and the ICT support have been explored in the higher education institutions of Kuwait.

TAM model is used as the framework of this study to critically investigate undergraduate's attitudes towards the use of ICT in daily learning. To examine these factors, quantitative and qualitative data was collected from the undergraduates of KHEIs and then analysed by using SPSS software.

The study helped in understanding the position of ICT in learning at both public and private KHEIs. The results indicate that all factors examined have a strong impact on undergraduate's attitudes towards and undergraduates use of ICT tools in learning. Apart from that, these results helped in generating a new model regarding the use of ICT in KHEIs.

The model portrays a clear perspective of the ICT position and its application to undergraduates ' learning at both private and public universities in Kuwait, as well as showing the important factors that influence undergraduates ' attitudes towards using ICT during their university studies, see [Figure 2].

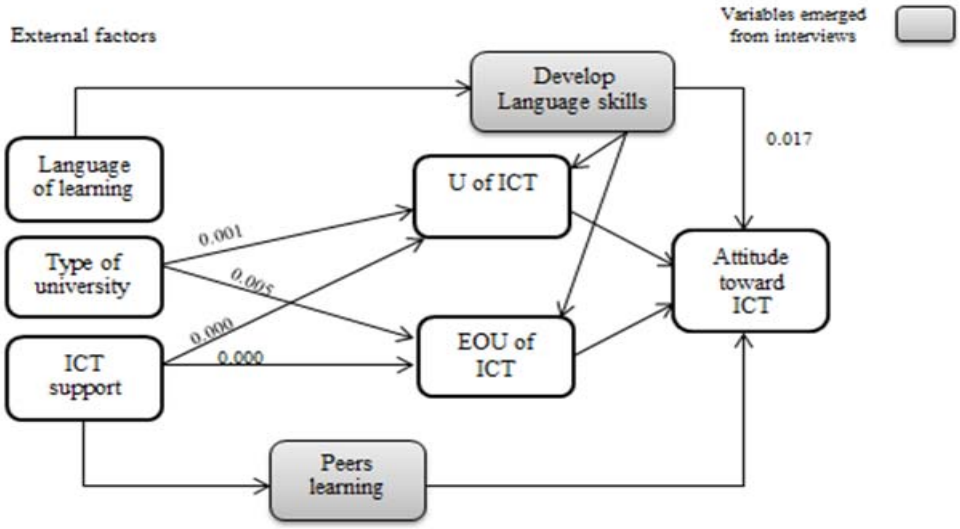


Figure 2: Suggested model for ICT use in KHEIs

The above Figure shows the important factors that emerged from the study concerning influences on undergraduates ' attitudes towards using ICT in their daily learning at KHEIs. The model retains the basic structure of Davis's (1986) model (external factors, PU of ICT, PEOU of ICT, Attitudes towards ICT). In addition, the model adds other factors the emerged from the qualitative results, such as peer learning and developing language skills as the factors to motivate the use of ICT among the undergraduates. It was evident through this research that peer learning has a significant role in improving undergraduates attitudes towards ICT.

Therefore, this study proposes facilitating ICT facilities and services through which peer learning is feasible. Also, the current study makes a significant contribution that might concern the tutors and educators at KHEIs in providing their undergraduates with a better education and learning through improving undergraduates' English skills. The analysis of the current research indicated that using the English version of ICTs (e.g. software applications) in undergraduates' daily learning has helped them to develop their English language skills. It is suggested that universities should focus on these two aspects in integrating this modern technology with education and alleviate the success of the undergraduates.

RECOMENDATION

Based on the above results and conclusions of this research paper, different factors were found to influence undergraduates' attitudes towards using ICT in their daily learning. Apart from the suggested model, following are the few recommendations that might improve the position of ICT in learning at KHEIs:

1. The peer learning factor amongst undergraduates should be reinforced, providing ICT facilities and an environment equipped with modern ICT, where undergraduates can exchange their experiences, skills and ICT activities at both the universities (public and private).
2. Tutors in the public university in Kuwait should encourage their undergraduates to use ICT in their English language version to enhance their language skills.
3. The tutors at both the universities in Kuwait should be motivated to use ICT in undergraduates' learning, by providing them with training sessions and workshops on the use of ICTs. This will develop their experience and skills in ICT, and they will feel more confident in utilising them for undergraduates' learning.
4. An important lesson for the institutions/decision makers is that they must lay emphasis on the cultural specifications as well as the primary language followed, in their particular institutions, rather than just adopting a standard e-learning adoption framework.

REFRENCES

Abdullah, A. M. (2011). Factors affecting business students' performance in Arab Open University: The case of Kuwait. International Journal of Business and Management, 6(5), 146.

Agbo, I.S. (2015). Factors Influencing the Use of Information and Communication Technology (ICT) in Teaching and Learning Computer Studies in Ohaukwu Local Government Area of Ebonyi State-Nigeria. Journal of Education and Practice, 6 (7).

Ali, G. E. & Magalhaes, R. (2008) 'Barriers to implementing e-learning: a Kuwaiti case study', International Journal of Training & Development, 12: 1, 36-53.

Alkharang, M.M. & Ghinea, G. (2013). E-learning in higher educational institutions in Kuwait. Experiences and challenges. International Journal of Advanced Computer Science and Applications, 4(4).
Arab Open University. The Case of Kuwait. International Journal of Business and Management, 6(5).
Bernárdez, M. (2003). From E-Training to E-Performance. Putting Online Learning To Work. Educational Technology, 43(1), pp. 6-11.
British Education Commission & Technology Agencies (Becta) (2004). A Review of Research Literature on Barriers to the Uptake of ICT by Tutors. Retrieved September 3, 2010, from http://www.becta.org.uk
British Education Commission & Technology Agencies (Becta) (2004). A Review of Research Literature on Barriers to the Uptake of ICT by Tutors. Retrieved September 3, 2010, from http://www.becta.org.uk
Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982–1003.
Doub, E.A., Goodwin, R., & Hunaiyyan, A.A. (2008). Undergraduates ' attitudes toward e-learning in Kuwait's higher education institutions.
Fančovičová, J. and Prokop, P. (2008). Undergraduates ' attitudes towards computer use in Slovakia. Eurasia Journal of Mathematics, Science & Technology Education, 4 (3), pp. 255-262.
Fu, J. (2013). ICT in Education: A Critical Literature Review and Its Implications. International Journal Of Education And Development Using Information And Communication Technology (IJEDICT), 9(1), 112-125.
Graff, M. (2003). Cognitive style and attitudes towards using online learning and assessment methods. Electronic Journal of e-Learning, 1, 21 – 28.
Hoque, S., & Alam, S. (2010). The Role of Information and Communication Technologies (ICTs) in Delivering Higher Education – A Case of Bangladesh. International Education Studies, 3(2). http://dx.doi.org/10.5539/ies.v3n2p97
Khan, S. H., Hasan, M., and Clement, C.K. (2012). Barriers to the introduction of ICT into education in developing countries. The example of Bangladesh. International Journal of Instruction, 5(2).
King, W.R., & He, J. (2006). A meta-analysis of the technology acceptance model. Information & Management, 43, pp. 740–755.
Kreisel, K. (2003). Evaluation of a computer-based nutrition education tool. Public Health Nutrition, 7, 271 – 277.
Liu, J. (2009). A survey of EFL learners' attitudes toward information and communication technologies. English language teaching, 2(4).
Merisotis, J., & Phipps, R. (1999). What's the difference? Change, 31(3), 12-17.
Mikropoulos, Katsikis, A., Nikolou, E., & Tsakalis, P. (2003). Virtual environments in biology teaching. Journal of Biological Education, 37, 176 – 181.
Rhema, A., & Miliszewska, I. (2012). The potential of e-learning in assisting post-crisis countries in rebuilding their higher education systems: The case of Libya. Issues in Informing Science and Information Technology, 9, 149-160. Retrieved from http://iisit.org/Vol9/IISITv9p149-160Rhema033.pdf.
Rhema, A., Miliszewska, I., and Sztendur, E.M. (2013). Attitudes towards e-learning and satisfaction with technology among engineering undergraduates and instructors in Libya. Proceedings of informing science & IT education conference (InSITE).
Rhoda, C., & Gerald K. (2000). Internal Consistency Reliabilities for 14 computers. Attitude scale. Journal of Education technology, 14.
Selim, H. M. (2007). Critical success factors for e-learning acceptance: confirmatory factor models. Computer and Education, 49(2), 396-413.
Selwyn, N. (2003). *Why students do (and do not) make use of ICT in university*. Available at: http://www.leeds.ac.uk/bei/index.html.
Selwyn, N., Potter, J., & Cranmer, S. (2009). Primary pupils' use of information and communication technologies at school and home. British Journal Of Educational Technology, 40(5), 919-932. http://dx.doi.org/10.1111/j.1467-8535.2008.00876.x
Sife, A, S., Lwoga, E, T., & Sanga, C. (2007). New technologies for teaching and learning: Challenges for higher learning institutions in developing countries. International Journal of Education and Development Using ICT, 3(2), 57-67.
Warschauer, M. (1998). Electronic Literacies: Language, culture, and power in online education. Mahwah, NJ: Lawrence Erlbaum Associates.
Williams, J. (2003). Computers and project-based learning. www.media-methods.com

Integration of IPad-Based M-Learning into a Creative Engineering Module in a Secondary School in England

Yulong Li
Department of Linguistics and Modern Foreign Language Studies, The Education University of Hong Kong
Hong Kong
yulongli@s.eduhk.hk

Xiaojing Liu
Department of Education Policy and Leadership, The Education University of Hong Kong, Hong Kong
S1107659@s.eduhk.hk

ABSTRACT
Mobile learning (M-learning) has become a popular topic in educational research, in previous research there have been many studies on attitude to M-learning directed towards staff, parents and students; however, limited research has focused on the comparison between teachers and students in the context of creative engineering and their respective opinions on issues of M-learning (iPad-based), comparing with other stakeholders' opinions. The study investigates the integration of iPad-based M-learning into a creative engineering module in a secondary school in England, applying a problem-based learning pedagogy. By using a case study approach involving semi-structure interviews, group interviews, and observation, the research participants, this research found that all of whom were involved in the creative engineering module, have a relatively objective and rational opinion of the affordance of the iPad, and the teachers were generally positive about the benefits of iPad-based M-learning in terms of discussing how it has changed learning as a whole. The results also challenge previous claims that the outcomes of M-learning are difficult to assess, thereby advocating a case-to-case assessment of the outcomes of M-learning. Some limitations of iPad-based M-learning were first discovered. The school's iPad policy integrates building of an online platform, evaluating teachers' belief in iPad-based M-learning and the expectations of students, irregular teacher-student communication, teachers' and students' self-training to facilitate iPad-based M-learning. However, the formal training in iPad use provided by the school was not well thought of by the research participants.

Keywords: ipad-based mobile learning, creative engineering, secondary school pedagogy

Abbreviations：M-learning (mobile learning); PBL (problem-based learning); CE (creative engineering); CE students (creative engineering students); T1 (teacher 1); T2 (teacher 2); T3 (teacher 3)

INTRODUCTION
This study compares how stakeholders think of iPad-based mobile learning (M-learning) is incorporated into a creative engineering (CE) module in a secondary school in England. M-learning, due to the advent of different kinds of mobile devices and their attractive and futuristic affordances, has attained popularity in education (Brand et al., 2011). In particular, the introduction of the iPad, by adding new functionalities to mobile devices, has reinvigorated scholars' and educators' interest in M-learning (Kinash, 2011). Indeed, many schools in different locations worldwide have started to pilot iPad use for teaching and learning, prompting many studies that are focused on the potential benefits of iPad-based M-learning.

In general it has been found that people exhibit a positive attitude towards iPad-based M-learning (Melhuish and Falloon, 2010). However, behind this trend favouring the iPad, there are questions over the compatibility of iPad-based M-learning, the genuine nature of its efficacy, and its so-called power to transform learning (Cochrane, Narayan and Oldfield, 2013). These doubts, as they relate to iPad-based M-learning and the pursuit of a futuristic ethos, adoption of new functions, and the potential benefits they represent are carefully considered in this dissertation. It also investigates the way in which iPad technology can bolster interest in those subjects that have previously been problematic to teach; in this case, specifically creative engineering.

LITERATURE REVIEW
Mobile learning
Following the advent of digital mobile devices, such as the iPod, iPhone and PDAs, and particularly with the increasing popularity of tablet computers such as the iPad, mobile technology is having profound influences on

peoples' lives (Attewell, 2005). The iPad achieved record sales of "twenty five million units…within the first fourteen months (of its inception)" (Jobs, 2011 cited in Oldfield and Herrington, 2012, p.1). This figure emphasises its impact on the use of mobile devices and their role in future living (Garcia, 2011). In the field of education, mobile technology is referred to using the buzzword 'mobile learning', which is normally abbreviated to M-learning (Brand et al., 2011). Increasingly academics and other interested parties are exploring the potential benefits of M-learning as a favoured and modernising approach to education (Kinash, 2011). According to Jardine, Clifford and Friesen (2008), because of its unique qualities, M-learning is emerging as best practice for teaching and learning; although concerns over its uses are still expressed in some circles.

Definitions of M-learning vary in accordance with different perspectives. Generally speaking, there are four strands that define M-learning: focusing on technology, focusing on changes in learning and teaching brought about by improved mobility, blended types focusing on both technology and changes in teaching and learning, and a purely behavioural description. In reference to the former, Beetham and Sharpe (2007) cited in Brand et al. (2011, p.169) defined M-learning as "technology driven, miniature and portable and as facilitating connected classroom learning". Similarly, Wang, Wu and Wang (2009, p.99) defined M-learning as teaching when "content is received through wireless internet and palm-sized computers, and thus M-learning usage can be considered to be a natural extension of computer use". Based on the aspects of changing in learning and teaching, Motiwalla (2007) defined M-learning as a strategy that empowers learners by delivering learning anywhere at any time. Sharples et al. (2007, p.225) defined M-learning as "the process of coming to know through conversation across multiple contexts amongst people and personal interactive technologies". Similarly, Melhuish and Falloon (2010, p.3) claimed the primary characteristic of M-learning to be "just-in-time, situated learning, mediated through digital technology in response to the needs of the users", which also symbolises a change in learning and teaching. With regard to the blended type, Kinash (2011, p.56) described M-learning as "a portable process of teaching and study using internet-connected devices such as laptops, tablets and smart phones". The fourth categorisation, the purely behavioural element, is reflected here: "M-learning means that students are tweeting questions, searching expert opinion, voting and ranking, viewing demonstrations, visually mind mapping and constructing and sharing expressions of their ideas in formats such as animations and movies" (Kinash, 2011, p.57). However, it is advisable for researchers to treat all definitions of M-learning cautiously, because it is an evolving and multi-faceted area.

Affordance and features of iPad-based M-learning

The iPad shares many similarities with smart phones, laptops, and e-readers (Melhuish and Falloon, 2010). However, it is an outstanding example of these. Unlike the normal smart phone, which people hold in their hands, or the laptop, which can be heavy and has an upright screen, the iPad is a light weight gadget as flat as a piece of paper and as thin as the diameter of a pencil. Thus, users can hold it, put it on a table, or stand it using a cover. It is described by Wray (2011, p.2) as "more of an extension of one's body rather than a separate machine". Therefore, users often keep it close at all times, similar to their mobile phones. He also pointed out that due to the streamlined design of the iPad, schools find it easier to store than a desktop computer, and can therefore fully utilise the device (ibid).

The iPad has a large and flexible touch screen, which can be used as an e-reader, but has more expansive colour and functionality. Therefore, at some institutes, students are starting to use the iPad instead of paper books and journals (Cochrane, Narayan and Oldfield, 2013). Most importantly, the wide screen design makes it possible for a group of 3-4 people to watch at the same time, fulfilling classroom needs (Li, 2012). iPad's touch screen facilitates straight forward user control, and Wray (2011, p.3) has claimed that "controlling iPad with direct touch from the user makes such use a different, involving and pleasing activity". The iPad also has its own unique operating system, the desktop Operating system (OS) which, according to Wray (2011) extends battery life. Therefore, it can to a large extent satisfy the demands of schools and users by outperforming the common laptop.

Most important of all, the iPad combines many gadgets with different functions. An iPad can function as an e-reader, a camera, a computer, a voice recorder, a drawing pad, an Mp3 player, and a port to the Wifi or 3G network. Therefore, according to Wray (2011, p.5), upon adoption of the iPad "educational organisations no longer need ICT suites" and due to its user-friendly design, "it could also be the start of a large reduction in the role of the technician in providing the technical support many schools need with their technology". All these affordances of the iPad contribute to its popularity, as do the accessibility to applications (apps) using the device.

iPad Apps

Customised apps are one of the core affordances of the iPad. According to Brand et al. (2011), the number of apps for use with the iPad and other similar products is increasing. Not only is Apple specifically writing apps

programs for iPad and its other mobile devices (Wray, 2011), but also textbook publishers and learning management system firms (Brand et al., 2011) are producing apps. This is a reflection of Melhuish and Falloon's (2010, cited in Naace, 2011) concept of effective apps: "they must be pedagogically sound in their design". However, in terms of other descriptions of good apps, Melhuish and Falloon (2010 cited in Naace, 2011) note that they "foster interactions that are grounded ... in M-learning theory, rather than focusing solely on content, engagement or edutainment" (ibid); but there is not much research or evaluation. Generally speaking, at present there is significant scope for further development of iPad apps, particularly for educational purposes. Wray (2011) stressed that it is necessary for educationalists working together with apps developers to produce better apps.

Training and support of iPad-based M-learning

The affordances of iPad based M-learning have been discussed. As has been stated above, the objective assessment of the affordance of mobile devices is essential when availing learners of potential opportunities (Melhuish and Falloon, 2010). Furthermore, how much and to what extent the affordances of an M-learning device are understood by practitioners determines the extent to which they are used in learning and teaching (Churchill, Fox and King, 2012). However, there are thousands of apps as well as different functions associated with mobile devices; thus, teachers can become confused about how best to select and apply these specific affordances in their classes (Wakefield and Smith, 2012). As the iPad and other similar devices are multi-functional and desirable gadgets, they contain features that can distract students (Morris, Ramsay and Chauhan, 2012). It should not be assumed that because the students are digitally aware, they are able to make use of the educational affordances of the device. Thus, relevant training to support iPad-based M-learning is essential.

Furthermore, according to Wakefield and Smith (2012), the solution to teachers being unprepared to use the device and its affordances is to instigate teacher training programs. Similarly, Morris, Ramsay and Chauhan (2012) suggest that encouragement to use mobile devices should also be given by training students in schools. However, neither group of authors mentions the importance of communication between teachers and students, and between teachers when dealing with affordances. Nor do the authors mention the importance of teachers and students' engaging in M-learning self-development. Churchill (2005) claimed that teachers' use of technology is largely influenced by their own private theories. Different teachers using the same device and apps may engage in different practices. Similarly, students always surprise their teachers by making "extensive use of some technologies to support their studies and virtual learning environment, often beyond their university's expectation" (Morris, Ramsay and Chauhan, 2012, p.98). Therefore, we might expect that through communication and sharing ideas teachers and students would be successful at acquiring M-learning knowledge and developing new methods for use.

When using iPad based M-learning, unique challenges related to the iPad emerge. One of these is the support offered in schools, for example, whether Wifi is widely accessible in school (Garcia, 2011). Another problem relates to ownership of the device. According to Traxler (2010), the iPad is intended to be a personal device, the effect of which would only be realised as optimum when each person has one (Naace, 2011). Until now, many researchers have conducted studies in schools which have a limited number of iPads for students to borrow, or who only use them occasionally in class (Kinash, 2011).

Research rationales and research questions

In previous research there have been many studies on attitude to M-learning directed towards staff, parents and students; however, limited research has focused on the comparison between teachers and students in the context of creative engineering and their respective opinions on issues of M-learning (iPad-based), and other stakeholders. Such a comparison, therefore, might raise new issues that have not been previously discussed. It has been discussed that the incorporation of M-learning into pedagogy is sometimes confined by standardised exams and the traditional curriculum; however, in the case study at the centre of this research, the CE class observed consists of students who are not studying to pass exams, and for whom the curriculum is brand new. Furthermore, the pedagogy of CE is problem-based learning, and there is minimal research combining a problem-based learning pedagogy and iPad-based M-learning. Thus, enquiring about how M-learning (iPad-based) is incorporated into CE pedagogy should to some extent contribute to both M-learning theory and engineering education.

This study will investigate how teachers and students were trained and self-trained before using iPads in class. It will also investigate whether there was any teacher-teacher or teacher-student communication focusing on the affordance of the iPad. Meanwhile, it is necessary to know how school A supports iPad-based M-learning in terms of policies, hardware and relative facilities.

In order to solve the rationales produced in the literature, the following research questions have been created: What do stakeholders think are the advantages of ipad-based M-learning? To what extent do the stakeholders think iPad-based M-learning or grades? To what extent do stakeholders think the improved outcomes for the students could be assessed? Can the iPad transform learning and is it just another learning resource? How were creative engineering teachers and students trained and supported in the use of iPad-based M-learning?

RESEARCH METHODOLOGY

In order to answer the research questions, the researcher designed a case study. Semi-structured interviews and group interviews were respectively set for CE teachers and student. Semi-structured interviews share both the flexibility of unstructured interview and the organisation and consistency of a structured one (Newby, 2010). Flexibility is demonstrated when the researcher feels the need to explore a certain point by asking follow up questions (Newby, 2010; Robson, 2011). In the current study, if interviewees are asked about how they use iPads in CE, they are likely to mention certain apps or functions. Therefore, the flexibility of a semi-structured interview may help to attain a clearer picture of CE students' and teachers' practices, as it allows for follow-up questions. Group interviews are time-saving by nature, and when conducted carefully are unlikely to damage data gathering, due to their respect for the integrity of each participant's opinions (Cohen et al., 2011). In the current study, the group interview choice was made predominantly on the grounds of the busy schedules of both the teachers and the individual students. Furthermore, group interviews are structured according to defined topics (Gillham, 2005). Putting groups of interviewees together to discuss research topics in a certain structured order is helpful when organising data. A group interview will enable and encourage interviewees to cross-check each other's comments while at the same time complementing and inspiring one another (Newby, 2010). It is hoped that this process will result in a more in-depth answer and therefore a more abundant data store (Arksey and Knight, 1999).

Non-participatory observation, to be more specific, the "inactive and known" (researcher merely standing aside and not join the activities of participants) (Newby, 2010, p.367) is used herein. According to Frank (1999, p.82), in a familiar environment, the researcher is prone to miss "hidden" or "invisible" information, and the involvement of a researcher may influence his or her judgment of the context. Therefore, engaging in active and known non-participatory observation may enable the researcher to see the researched issue from a different perspective to insiders; to focus on observing participants' behaviours; to distinguish whether their behaviours are similar to what they have described, or whether a new phenomenon emerges (Newby, 2010).

Nominated sampling was used when choosing interview participants at school A. According to Morse (2004, p.885), "nominated sampling… is particular useful when groups are hard to identify or may not volunteer or respond to a notice advertising for participants". The main reason for using nominated sampling was that it was difficult to contact the CE teachers and students as a visitor. Another reason was that due to the teachers and students all having tight schedules, nominating particular people to participate in interviews at particular times was beneficial for school management as well as for the participants. Recommended by the principle of this school, three teachers teaching creative engineering were summoned; a cohort of ten CE students were arranged by their teachers to participate a group interview, and the students were all had been using iPad to study creative engineering for more than a academic year; furthermore, another group of four who was about to participate the CE in the next academic semester was also chosen for the purpose of comparison. The research data was collected using a voice recorder for interviews, and for observations with field notes. Respondent triangulation was also used in this research to assure the research validity by 'comparing many sources of evidence in order to determine the accuracy of information' (Bush, 2012 p.84), which means making enquiries about different participants and consistently asking the same questions (McFee, 1992). In this research, the teachers and students were asked similar questions in a structured order. Thematic coding was achieved using Nvivo 9 to analyse the qualitative data. The data collected for this research was gathered and organised according to the research question it pertained to.

FINDINGS

What do they think are the advantages of iPad-based M-learning?

T1, T2, T3 and the CE students gave some similar opinions when defining the advantages of the iPad, for example the advantage of gaining "independence"; however, in their perspectives on other issues were diverse. In addition to the direct participants in the CE module, a group of pre-CE students who had not yet been enrolled in CE were also interviewed; their opinions offered a contrast to those of other CE members. The data is organised according to participant type in themes.

T1 considered two different perspectives when answering the question: the benefits to students' abilities and those to practical study. T1 concluded, when asked about the advantages the iPad brought to enhance CE

students' ability, that "it's building their resilience, their problem-solving [skills], their independence, [and] their creativity". He particularly emphasised students' increased independence to be the product of "the combination of the problem based learning and the mobile technologies", which "is allowing them to work and think more independently". Moreover, he also gave some examples of the advantages of iPad in terms of practicality, for instance, "flexibility and the whole range of different applications it's got". He also said "they can almost work electronically and faster but also it's giving them immediately access to the internet and information research" and "they can go straight on maybe to YouTube and find a tutorial". Therefore, from the above quotation, it can be concluded that T1 believes the advantages to be flexibility, speed, supportive, accessible online content and the support of apps.

In addition to independence, T2 pointed to the modernity of the iPad as an advantage, saying that
"[As] we're doing a creative engineering course you'd like to think that what we're doing is quite futuristic… the ethos of the course is creative engineering, we're meant to be creative and we are when we use the apps… we're talking about current developments in technology and you can't get any more current than this [the iPad]"; "it fits nicely with what the remit of the course is."

Furthermore, he also mentioned convenience, stating this is due to "the ease of use basically . . . it's easier to give feedback on work because the work comes in and is delivered straight to your iPad so there's no chasing work around as it were." In contrast, T2 stressed the advantages of the iPad in bringing an up-to-date and futuristic quality to the CE module, also mentioning the practical value of the iPad in terms of convenience.
Interestingly, T3's ideas also differed from those of T2. Aside from citing "independence", he stressed mobile, collaborative and supportive elements as the advantages of the iPad. He said:

"We feel that it's a little bit more mobile. So that rather than going to a classroom, booking a classroom and having all of the students log on to find various things that they would need IT for they can use that as they're moving around".

He then added, "I'd say pace to work collaborative learning where they can be more collaborative with the sending of things, with the working of things, working together, are the main reasons why we use", and claimed that "they all work on different projects and I can't be an expert in every single part of engineering, I'm not an engineer". From T3's quotations, it seems that he was considering the advantages at a more practical level.

In terms of current CE students, it is interesting that they also expressed independence as an advantage of the iPad, in that they valued "the management side of it is you can choose what you do, like you can choose the certain apps that you want to use for the research and stuff". "Speed" is another word extracted from their responses: "I think one of the main aspects is probably the speed" and "it's quicker to do it on an iPad than a PC". Furthermore, "more apps, more choices" is also an advantage mentioned by the CE students:
"You've got a lot more technology that you can actually use like the apps allows you to do stuff that you wouldn't be able to do on the computer"; "the apps are a lot better than the actual computer systems because it allows you to get a lot more on iPad" and "you can choose different apps for education."

From the transcripts, it can be seen that the CE students enjoy the inherent affordances of the iPad, such as speed and supporting apps, which is understandable when recalling that they were designing a racing car using an app called Wind tunnel, thereby engaging in engineering research. The strong and diverse apps indeed offer the students the techniques they require, along with fast access to the internet and any apps or functions associated with the gadget.

There was also a group interview with a number of students not yet enrolled in the CE module. Their answers to the question differed from those of those learners currently on the CE course. Although there were some similarities, for example, the advantages of speed, "you can look up stuff easier than going on a computer"; and convenience, "you can like directly quote things as well" and "if you've done some work at home then you can just put it on your tablet or your iPad and then you can bring it in and you can access it at school as well without having to do drop box or anything like that or Google plus". Mobility was also mentioned: "it's more portable" and "it's lighter as well than a big textbook."

Yet what distinguished these students from those doing CE were the advantages they mentioned: multi-functional, learning being easier and more fun. Firstly, they mentioned multi-functional as an advantage: "it's also like if you're in the other classrooms then you don't have to book a computer suite." Their viewpoints seemed to confirm that the iPad could replace the entire computer suite in future. However, in real CE studies, on many occasions, the functions of the iPad were found not to match a computer. For example, in the follow-up

interview with T1, he indicated that "they [students] have to do the programming in the Mac Book, the iPad can't affect the programming"; the CE students also said "they're [iPads] not as precise as computers because you have the mouse and like you can do better." Therefore, from the perspective of those involved with CE, the iPad is not perfect and should sometimes be used only in cooperation with other materials. Additionally, the pre-CE students seemed certain that the iPad would make learning fun: "students are more enthusiastic about it and when you can bring something they're interested about and combine it with learning then you get like better results" and "people are always bored if teachers hand out textbooks and you immediately textbook, urgh, I'm not doing this lesson. But is you can just use you iPad and your tablet then it's their own stuff". Whereas, in comparison, to the CE students, the second group of students' answers seems light-hearted and not objective or rational. This difference could be due to the CE students being involved in the engineering work through design, research or experiments, and it is very likely they have more opportunities in evaluating some functions of the iPad and making comparisons with other techniques after experiencing both. Generally speaking, the interpretation of the advantages of the iPad relates to the roles of the people involved and the ways in which they use it.

To what extent do they think iPad-based M-learning could improve students' learning or their grades?
From the transcripts, all the CE staff seemed to have a positive attitude towards the benefits the iPad can bring to CE students' learning. Despite this, none of them mentioned whether the students' grades could be increased as a result. This is due to the fact that the CE module does not offer examinations; T3 said, "we are not giving a grade; it has the outcome and a certification that goes with that outcome." However, as summarised previously, T1, T2, and T3's focuses are different. T1 is positive in terms of the influence of the iPad from a theoretical level, as well as in a long run:

"It can transform the way that you learn and it can allow children to learn in ways or achieve things that they couldn't have been able to do before"; "it's transforming both the way in which they learn, the freedom or the greater control they can have over the learning but I also think it can deepen the learning through."
When it comes to T2, he not only admitted that students' learning would be improved: "I can basically see the benefits, I can see the benefits", but also their grades:
"Do you think the iPad can improve students' marks and scores in exams? R: Yes, definitely"; "In terms of creative engineering do you think it improves their performance? R: yes definitely."

He gave an overall explanation from both an administrative angle and from the point of learning efficiency, which is consistent with his role in CE:
"They're using current technology, they're able to access information faster, they're able to get feedback off us quicker, we're able to administer things better which frees up more time for us planning the quality of the resources."

He also said "in terms of improving learning I'd say it's easier to give feedback on work because the work is coming in and it's delivered straight to your iPad so there's no chasing work around as it were" and that "in terms of improving learning as well like I say it allows them any access to any research that they want to do using the internet of course"; "in the way that if they're able to access learning faster, if they're able to receive feedback off me quicker, then that surely is going to improve the grades. If they've got access to applications which allow them to work in different ways then they might be able to find a way which is suited to them rather than one way for all, pen and paper which is what it is." T3 was asked the same question, and confirmed that students were improving in terms of outcome because of the constant feedback: "they come to us and say what about this, I've done this, how can I go move forward; so it's all about me just facilitating once we've set up all the information that they need." Differing from the T1 and T2, he looked at this question just in terms of the scope of teaching and learning.

However, with regard to the CE students, their opinions towards whether the iPad could improve learning and grades differed from each other. Many of them admitted that the iPad could improve their learning, for example,
"For like revision and stuff, my GCSE Science which is on YouTube and it's just quicker to load it up then finding a page in a textbook, so it's a lot easier. So the score might improve from quicker"; "In maybe coursework kind of sides yes and also because there's my GCSE science it's on YouTube which it's easier to get on an iPad then on anything else; I've been using that for science revision today so."

Furthermore, some students held the belief that use of the iPad would improve their grades: "Do you think your score has improved than before? R: Possibly yeah." However, when asked about their grades being improved, they must obviously have been referring to other subjects that offer exams.

However, many student participants rejected the possibility that their grades might be affected, for example: "I think that the iPads don't really do that much really to increase your grade, but you can probably do that same thing on a PC as well so sort of pros and cons to improving your grades." Similarly, another claimed "I think some aspects of using iPad will help improve but mainly it's just down to what you know and there's stuff that you can do on a computer that you can do on an iPad that I've been using to help improve my scores. I don't think they make a huge difference." Their opinions seem to consider the iPad and the traditional laptop or computer as similar. There are also different explanations of why they do not think the iPad will necessarily improve their marks, for example: "it's because it's quite a big grade boundary that's all so I've been usually getting it as an A* so it's quite difficult to improve on" and "not really, science has always been my strongest subject but it's gone up by a bit, my marks have improved but the grade hasn't". It could be understood that many of the CE students are very good at certain subjects, such as science or chemistry, and that their strengths or interests sometimes contribute external factors, which influence their academic outcomes. Therefore, it is difficult to assess whether the iPad has improved their grades.

To what extent do they think the improved outcomes for the students could be assessed?
In terms of assessing the outcomes for students after using the iPad, T2 seemed slightly negative. According to him, on the subject of the assumed method of assessing the outcome: "you'd have to do it with a sample of students and say look, generally this cohort of students is about the same sort of demographic, the same ability as that set of students, they're the ones with the iPads, they're the ones without the iPads. Take away any factors between them, that's the way you'd have to do it I could guess", but he also said "I've not really given that much thought to be honest."

In terms of T1 and T3, they both indicated that the nature of the CE module means that it cannot be assessed in a summative way; therefore, it was not possible to offer any grades. T1 said, "that's a difficult one for us at the moment in terms of having hard numbers because this course is designed to give them experiences which aren't examined, there's not an examination", and T3 stated, "we are now giving a grade; it has the outcome and a certification that goes with that outcome, if they don't have it then they haven't passed it" and added that "if they didn't produce their essay they didn't go to Warwick, they didn't get a certificate for the portfolio so the assessment's different I suppose."
Although the CE module does not use summative assessment, T3 claimed that formative assessment had been used, which is also how she thought CE students' learning outcomes could be guaranteed:
"So our feedback is formative and written to how to improve rather than it is to give them a grade' and 'they [students] come to us and say what about this, I've done this, how can I go move forward; so it's all about me just facilitating once we've set up all the information that they need."
In relation to this point, because the iPad facilitates the delivery of feedback, in this instance it is assisting in formative assessment.
Furthermore, one student from the pre-CE group gave an idea of how he assessed his progress; he said, "like in English I'm not very good at spelling so now I'm typing it up it's underlined what's wrong so I can change that and then I've got a higher mark because I've not got loads of spelling mistakes all over the page." In this way, the improved performance as a result of the iPad could be assessed.

Can the iPad transform learning and is it just another learning resource?
In answer to this question, T2 responded: "So do you think it can completely change learning? R: Given enough time yeah. Given enough time probably." The reason he stressed the need for more time was his belief that many obstacles remain unsolved; for example, that not all teachers are comfortable with using iPads: "if the teacher is comfortable and willing to go along with the technology and use the technology, it completely transforms it."

T1's reaction was very positive: "it is transforming learning, it's transforming both the way in which they learn, the freedom or the greater control they can have over the learning but I also think it can deepen the learning" and "it can transform the way that you learn and it can allow children to learn in ways or achieve things that they couldn't have been able to do before." He also gave an example to support his argument:
"In art, students with the iPad could actually, erm, create their own gallery, they could put that gallery online and they could receive feedback on that. They can look at the different countries they got feedback from, they could consider cultural aspects of the feedback that they're getting, cultural responses to their art, yeah, from around the world. Now that wasn't possible before the internet, now that's not necessarily iPad but before the internet they couldn't do that but the iPad gives them tools to do that easily, yeah. Now that's learning that couldn't have been done without the technologies we have now."

This example is consistent with T3's response; he said,
"I think there are times when I am frustrated that there are things that I wish things could be done and they can't

be done because of how systems can be set up in school and Wi-Fi experiences, etc. Also to do with the potential of things I think, so for example if they were designing the apps are getting better that they have access to but originally there wasn't really much for designing. It's obviously taking that design and then what are you then going to do with that design, how are you going to get it off the iPad and what formats does it work in as opposed to the standard more expensive equipment that you can get."
T3 gave this example in support of his opinion regarding a particular question: "I: I read in some articles that some people have the opinion that the iPad and other tablets are just adding a learning resource, what do you think of this opinion? R: I think in some respects that is correct."

In terms of the opinion that the iPad is a resource, T1 offered a different viewpoint:
"It is a resource but it's also a tool to use. It's not just something you go to and look at, it becomes part of. It's like a car; would you call a car a resource? A car is part of you isn't it, it becomes part of you and your life and it allows you to do things in your life or gives you a lifestyle that you wouldn't have had. A car takes you to places every day that you wouldn't have gone. Well the iPad's like that for them, it can take them to place they couldn't."
As he explained, the iPad is a tool like a car, which actually merges into our lives. In this sense, no matter whether it is a tool or resource, it has changed our learning and "allows you to do things in your life or gives you a lifestyle that you wouldn't have had". Therefore, it is of little relevance to argue about whether the iPad has transformed learning or whether it is just another learning resource.

What do they think of the disadvantages of iPad-based M-learning?
According to the coding, the disadvantages can be generally categorised into seven areas: the default operation system, problems with the apps, the supporting facility, the ownership of the iPad, doubts in teachers' critical awareness of the iPad's affordance, the compatibility between the iPad and other brand products and that it cannot beat face-to-face teaching.

The first point concerns what most research participants have been worrying about, in that T3 argued that the iPad could not provide instant printing: "if I want something very quickly on paper there's no air print facility because of how systems are set up". Additionally, he also complained about the keyboard issue, saying, "it's a new way of typing and the predictive text changes all the time", which is echoed by a CE student who claimed that "you can buy external Bluetooth keyboards but you're spending more money and if you want to do work it's easier to have another keyboard instead of using the onscreen one". The touch screen in many cases seems advantageous, but another CE student claimed that "they're not as precise as computers because you have the mouse and like you can do better"; a further reason provided was that "on a PC you've got a mouse to point but when you're using your fingers you can't really get the, if you're building a model you can't get the right angle and stuff like you can with a mouse so it's quite hard to use it".

The students also remarked that the processes available on the iPad were not as good as those in a computer; for example, "so you needed a PC then to actually get on Solid works and actually carry on designing, so I think that's a main issue with the apps that are available on a PC that you can't sort of just get on an iPad." Lastly, the students also argued that the storage of the iPad was not ideal: "I think the amount of storage space they've got can sometimes limit what you can do on them." Generally speaking, all these limitations relate to the default hardware used, which to some extent means it cannot satisfy the requirements of CE. This is due to, for instance, the precision of the mouse and processing capability of CPU, and even the storage available for saving important design files or models that is critical for CE design and research.

In terms of the problems with certain apps, T3 claimed that it is too tiring to learn to use multiple new apps: "there are just so many applications everyday it's hard to keep up". He also stated that apps are sometimes incompatible with the intended learning aims: "constantly finding a better app for a better purpose because it shouldn't really be about the app, it should be about the learning and the app should fit it but you need to know what the apps are to fit in." As he described, he has to pilot the apps for students in order to be able to recommend them as useful tools for CE. However, his complaint regarding the inconsistencies between apps and lessons, has been echoed by many people; in general complainants advocate a refined M-learning pedagogy with embedded apps specifically designed for certain procedures. Alternatively, T1 pointed out that some of the apps, such as "iMovie", were not as well thought out on the iPad as the iMac: "some of the applications that are on the iPad there are more sophisticated versions on the mac." However, this may be due to the default hardware on the iPad; thus, the problem can only be resolved by producing a new iPad with a more powerful CPU. In cases where students have the opportunity to switch between different technologies, these limitations do not affect learning.

Furthermore, the facilities supporting widespread use of the iPad are also sometimes problems. One student complained: "when you're out and about you don't always have internet connection so it's difficult to research stuff while you're around if there's not decent Wi-Fi." Another also mentioned that "you have to buy a separate iPad if you want to use it out and about everywhere, the cellular one, and 3G so that you can just use it anywhere. The ones at school are just Wi-Fi so it's harder to use it anywhere". The ownership of the iPad has also become a supporting facility problem, because teachers and students having iPads might resort to different methods of teaching and learning. It was clear from the concerns of T3, for example, the potential for "a member of staff who doesn't have an iPad and really doesn't know the potential of them". However, as T2 stated, even teachers who have iPads, if they are not aware critically of the affordance of the iPad, may not use it well: "the biggest limiting factor to using iPads is the teachers' knowledge of what's available to use, how to use it and how best to get out of it to deliver what they want to deliver basically". T2 also pointed out that iPad-based M-learning should not replace interaction between people: "as well there is no substitute for one to one contact obviously and successful teaching is built on successful relationships and you can't have a relationship with somebody through an iPad". He also commented that, due to the popularity of the iPad, many other brand tablets are now being influenced: "The limitations for those students, what I'm a bit wary of is the fact that I don't want them to have like blinkers on, think it's Apple or nothing. It can be quite worrying to think it's Apple or no way".

How were CE people trained and supported in order to use iPad-based mobile learning?

How were they supported?

Based on the answers given by the research participants, the school has been adopting various methods to support iPad-based M-learning. This support is demonstrated in the school policy, wifi facility, expectations of students, and the iPad group. The school has been offering a buy back policy, which was explained by T3 thus: "it's like a hire purchase scheme so what you do if you pay a monthly fee and then at the end of your two years there is a buy back policy"; another student added: "at the end of the scheme you've got to pay £10 and then that's yours then…the scheme is over 4 years and you pay in monthly instalments". It is known that the iPad is a costly product, and according to the teacher "a larger proportion of students [are] coming on board but not every student has an iPad"; therefore to some extent this policy might eliminate a dire situation as regards availability of iPads. As a consequence, many teachers and students indeed buy their iPads using the scheme, for example, "I've bought into the scheme and the scheme I felt for me; I don't know if it offered the best value, it just seemed an easier route, I didn't have to go into a shop and sit there and get the best deal and listen to all the chat. I could just sign up and get that done." (T3)

In this way, this policy also makes buying an iPad easier. Wifi and the school's online interactive platform also show the supportive insurance of iPad-based mobile learning. The former is essential for the iPad to connect to the internet, and the latter allows students and staff to interact. According to one student, 'they (school) have set them up with internet and the network so that you can access your files that are on the computers on your iPad as well which made it easier when you're at home to do work'. In a recent Ofsted report, this school is rated as ICT affluent, in that wifi is accessible in every classroom. According to T2, a visual learning environment is required for students and teachers to interact. As has been discussed, a Twitter account has been set up for each module in order to encourage communication. Most importantly, teachers' beliefs and expectations about the value of the iPad to students are also supportive. Although this idea has not been recognised by many people as yet, according to one student, teachers' expectations really count. As they responded, "they're encouraging us to use it in lessons"; "we were just like expected to pick it up because we're used to technology so we can learn quite quick how to use the technology. So I think we were just kind of expected to know how to use it." In addition to this, the iPad group is another support system offered by the school. According to T2, "there's an iPad group which meets every fortnight I think and that talks about apps that are being used in classrooms, how good it is, what to watch out for, new things". He further hinted that teachers also communicate with each other there, about different apps.

How were they trained?

In terms of training for iPad-based M-learning, according to their responses the interviewees were both school trained and self trained, although self training appeared to be of greater significance. T3 stated that "I was not trained to use an iPad…so for me it's always been self-training, looking things up and speaking to other people about how to do it". But then he added that he had some training at school:

"We have had some school training in a training day and a gentleman from Apple came in, this was a couple of years ago and he showcased what the iPad would be able to do. I: Was the affordance he showed related to education? R: Not particularly, I don't think so. I: Quite general? R: Yeah."

Similarly, T2 claimed that "I: You learn by yourself most of the time, the school teaches you a little bit but most

of the ideas..? R: It's probably a 60-40, 60 me, 40 school." When the students were asked how they were trained to use iPad-based M-learning. One student responded: "I think we were just like expected to pick it up because we're used to technology so we can learn quite quick how to use the technology. So I think we were just kind of expected to know how to use it."

Teacher-student irregular communication is another way of training. This kind of training is random and in many cases essential. T3 gave some examples of this, "I personally go round and ask them… what are you doing, what have you got and have you thought of this? When there's a spare minute in class I'll so say have you thought about this and then obviously therefore we have a discussion about what they're using"; "we can offer apps for students." Similarly, T2 claimed "I ask them if you've found any apps which are interesting that we might be able to use. Every so often you hear back from them." These actions have been confirmed by students:

"If there's a new app that we've got and we don't know how to work it we'll ask the teacher how and then they'll like demonstrate to us"; "especially creative engineering at the beginning of every lesson our teacher would normally say oh I found a new app on the market which specialises in what we're doing at the moment and that's a good way because you know…teachers do let us know of new apps on the market that will help progress our learning."

DISCUSSION

What do they think are the advantages of iPad-based M-learning?

A perception shared by the teachers in this study is that the combination of iPad-based M-learning and PBL pushes students to be more independent. This independence has also been recognised by Kinash (2010) and Garcia (2011), who advocated that M-learning could turn students into more proactive and autonomous learners who direct themselves in their learning. Resilience was also mentioned in the findings, which is consistent with Garcia's (2011) claim that, through M-learning, students know what resources to utilise in order to solve problems; furthermore, Kinash (2011) claimed that students could understand 'ways of responding and can choose creative formats that best demonstrate their learning' as a result. The aforementioned problem-solving skills identified in the research findings could also be related to the outcomes of diversification and enrichment in learning experiences (Peter, 2009), such as situated learning (Klopfer and Squire, 2005), which means having students learn to deal with lifelike problems in emulated situations. Most importantly, this finding (problem-solving) could satisfy ABET's (the US engineering degree accreditation organisation) requirement for future engineers: 'learning to… solve engineering problems is an essential outcome for engineering graduates' (ABET, 2010, quoted in Marra et al., 2011, p.124). Creativity was also mentioned by T1, in a manner similar to that Jahnke (2011) advocated; i.e. that students' creativity could be enhanced with technology enhanced learning.

In the findings, the forward-thinking ethos of using iPad-based M-learning was also echoed by what Adam and Felder (2008) described, in that engineering students should show their abilities in the application of new knowledge and technology. This finding is additionally consistent with the opinions of Garcia (2010), and Wakefield and Smith (2012), in that being able to use iPad-based M-learning is essential for students' futures. The findings also demonstrate that the constant levels of feedback the iPad supports was welcomed by Kinash (2011) too. The CE teacher said that the collaborative nature of iPad based M-learning was beneficial, which was mirrored by George and Serna's (2010) opinion regarding the facilitation of the iPad for students to work collaboratively. The self-management and support offered by the iPad is further reflected by Klopfer and Squire (2005). In addition to these, the apps, speed of accessibility to internet, mobility, convenience and multi-functionality are all reflected by Wray (2011).

In the findings, some Pre-CE students claimed that iPad-based M-learning was fun, which is consistent with what Hartnell-Young and Heym (2007) said regarding teenagers being more open to m-devices. However, not everyone felt that iPad-based M-learning would make their learning fun, as with the CE students. Similarly, these Pre-CE students also commented that the iPad could replace the computer suite, which to some extent is consistent with Wray's (2011) proposition that eventually students may no longer need ICT suite. However, the CE participants themselves found that the iPad could not replace the functionality of the iMac. The results show that the CE students' attitudes towards iPad-based M-learning were apparently more serious, objective and rational, which could be due to their experiences using different devices to complete their projects during their CE course. According to Melhuish and Falloon (2010), an objective awareness of the affordances of the iPad is essential in applying the device. Therefore, this finding to some extent initiates some templates for other institute leaders or curriculum developers to use as a base for how to teach students to consider m-devices critically. This finding is also a breakthrough in terms of the long-held superstitions surrounding the benefits of M-learning (Jardine, Clifford and Friesen, 2008).

To what extent do those involved with CE think the iPad-based M-learning could transform and improve students' learning and their grades? How could the result be assessed?

In general, the CE staff were positive about the possibility of iPad-based M-learning to transform and improve students' learning, albeit with an awareness of the limitations of the iPad. This result is consistent with some other authors' attitudes towards M-learning devices (Jardine, Clifford and Friesen, 2008). In terms of CE students' improved academic outcomes, T3's opinion was that the constant feedback from formative assessments supported by the iPad was working on students' learning well; this result was predicted by Kinash (2011). However, as mentioned, not every CE student agreed with the improvements made possible by the iPad. One of the reasons behind this was that they may have always been good at a certain subject and their grade for that subject was already high, so the application of iPad-based M-learning did not make a difference to their grade. This finding is consistent with that of Kinash (2011), who claimed that many external factors can influence assessment of the outcomes of iPad-based M-learning.

Unlike the negative issues raised by previous authors, such as Brand et al. (2011), in terms of the validity of M-learning, particularly, the results of M-learning regarding the improvement in students being difficult to test this research has raised some different views. Firstly, a course such as CE, which was designed not for examination, should not be expected to track students' learning and progress via a comparison of their grades on tests. Secondly, the PBL pedagogy of the CE module also dictates that formative assessment in this context could be the more suitable option for students' learning; this is because "in PBL settings, students may feel disempowered by assessment methods that do not match their PBL experiences" (Savin-Baden, 2004, cited in Marra et al., 2011, p.125), such as tests, but feedback from the teacher is what the learning of engineering students relies on in order to further their projects (Marra et al., 2011), which was confirmed by T1, T2 and T3. Therefore, it is not necessary to use a summative assessment (test) to discover whether students' potential learning improved through iPad-based M-learning in the context of CE, and the students' improved outcomes may not always be best demonstrated through tested outcomes, such as the CE case. Therefore, this result poses a criticism of the work of Brand et al. (2011), which stated that M-learning is not valid, due to the difficulty of testing it; it leads to the observation that test results cannot represent fulfilment of learning outcomes in every context. Interestingly, in an interview with another group of pre-CE students, one said affirmatively that his literacy mark rose after using the iPad, and his reason was that the iPad could correct his spelling mistakes; thus, compared to his previous work that included spelling mistakes in assignments, the current grade was improved, also highlighting the limitations of Brand et al. (2011). Therefore, both of these examples are valuable in challenging previously held opinions about the difficulty of assessing M-learning outcomes (Brand et al., 2011), and a case by case assessment of the outcomes of M-learning is necessary.

The debate as to whether the iPad is just another learning resource

From the findings, it can be seen that T2 is positive as regards the iPad's potential to transform learning. However, T1 and T3 stressed that the iPad could also be a learning resource but that it has become part of learning as a whole. As T1 stated, 'it has become a part of you and your life and it allows you to do things in your life or a lifestyle that you wouldn't have had.' This reply could be symbolic of iPad as an external resource that also participates and alters student learning. Furthermore, from the perspective of educational neuroscience, cognitive pleasure could contribute to higher learning (Sadlo, 2011). As the findings show, some students felt they were having fun, which could be regarded as triggering cognitive aspects of motivation when they used the iPad to study. According to Le Merrer (2009), cited in Sadlo (2011, p.440), "internally generated endorphins may be released to reward our innate hunger for information", when students feel they are having fun (students have termed cognitive pleasure) due to using the iPad. Furthermore, as said by Sadlo (2011, p.440), "the human brain is 'wired for pleasure' according to Biederman and Vessel (2006, p.249) and we have been using substances to stimulate these particular neural system for millennia". In this case, the iPad could be regarded as the stimulating substance. Therefore, although the iPad may be regarded as an external resource, due to this feeling of fun, learning efficiency may be improved. This answer is to some extent contradicted by what Bowen (2012, p.xiv) claimed, however, in that "new technology will not alter the way brains function and human being learn." It is also in contradiction with Brand et al.'s (2011) opinion, that M-learning devices cannot change learning.

According to Gould (2012), an informal and relaxed learning climate is very important in order for learning to occur. Similarly, again from the perspective of educational neuroscience, a relaxed learning environment is important: "cognition is enhanced when stress is low because the heart sends more blood to the cortex" (McCraty, 2002, cited in Sadlo, 2011, p.441) and "reducing stress within the learning environment needs to become the highest priority for teachers everywhere" (Sadlo, 2011, p.441). Thus, when learners feel they are having fun and are relaxed while they are studying on iPad, learning is rewarded; disputing Brand et al.'s (2011, p.170) point that, "learning takes place naturally … regardless of adjectival contexts of learning". In general, the iPad as a learning resource is changing learning as a whole.

What do those involved with CE think are the disadvantages of iPad-based M-learning?
The disadvantages of the iPad, as seen in the findings, are as follow: some problems with default operation system of iPad, problems with apps, the supporting facilities, the ownership of the iPad, doubts in teachers' critical awareness of the iPad's affordance, the compatibility between the iPad and other brand products, and that it still cannot beat face-to-face teaching. Some of the limitations were first discovered when those involved with CE were engaged in research and projects; for example, the problems with regard to the iPad operation system and apps. Although Wray (2011) claimed that the OS (iPad operation system) has many advantages, such as the extended the battery usage time, CE teachers and students said that this system could not surpass the iMac in some forms of industry design processing. Similarly, apps on the iPad are highly thought of by many people, such as Wray (2011), but from the interviews we know that the apps' manufacturers made two versions: one for iPads and the other for computer use, the latter of which has been found to be superior by those involved with CE. Furthermore, the precision of the mouse and processing capabilities of iPad CPU, and even the storage for saving files are not well thought of by those involved in CE.

Some limitations were already been noticed before, such as whether teachers can critically evaluate the affordances of the iPad; ownership and whether each person can have one, along with access to supporting facilities. The former point was confirmed by Melhuish and Falloon (2010), as they claimed that failing to offer full access might cause poor utilisation of the iPad. The ownership of the iPad was in fact mentioned by Traxler (2010), who stressed that the efficacy of the iPad could only be optimised when each person had one. In the context of school A, if in one class some students have iPads and other do not, the teachers would have to prepare two kinds of lesson, which is problematic. Meanwhile, supporting facilities mentioned by those involved with CE concerned Wifi, which was consistent with the issues raised by Garcia (2011).

However, the current study also raises two interesting arguments: one is the compatibility between the iPad and other brand products, and the other is that it cannot surpass face-to-face teaching. The latter point is not a new one. Before the birth of the iPad, the pros and cons of face-to-face education and distance education were widely debated. An opinion from educational neuroscience may provide an explanation for this limitation; according to McCraty et al. (2005, cited in Sadlo, 2011, p.438), "electro-magnetic fields of the heart radiate several feet from each body, and when human beings meet these fields apparently merge and enhance non-verbal communication and sensitivity to each other", which is commented on by Sadlo (2011, p.438), in that it can "explain the advantages and richer feelings of meeting personally together, rather than via internet". In terms of the former limitations, there is not a great deal of studies from which to draw information. However, the differences between the various brands of tablets should be made evident to educational practitioners.

How were those involved with CE trained and supported in order to use iPad-based mobile learning?
The "buy back" policy introduced by school A could be used by other institutes too, if they are also struggling with issues regarding ownership of iPads. This policy in school A helped both teachers and students. This finding echoes Traxler's (2010) claim, that the iPad is intended to be a personal device, the effect of which would only be realised as optimum when each person has one in hand. The school had also been improving Wifi coverage, as well as online interaction platforms such as Twitter, which could be a point of reference for other schools. The teachers' beliefs and expectations were another form of support from the school's side, which is consistent with the ideas of Morris, Ramsay and Chauhan (2012), as teacher expectation has always been influential on students' learning (Rubie-Davies, 2008); a teacher's belief, according to Pajares (1992), will to a large extent inform their teaching, which in this researcher's opinion has opened another channel of support for students and iPad-based M-learning. However, the formal training offered by the school was not satisfactory enough in the opinion of the teachers and students, and they admitted that a large portion of how to learn and teach by iPad was from their own intuition and their previous experience of using smart phones and computers. Just as T2 said, 60% of his iPad knowledge is from his own experience; plus there are some students who have claimed that they learn to use iPad by themselves, supporting the view that self training is important in iPad-based M-learning (Churchill, 2005; Morris, Ramsay, and Chauhan, 2012). It has, however, been confirmed that teacher–student communication is enriched by the students' iPad knowledge. As mentioned in the rationale, teacher–student communication and training has seldom been explored in previous studies, and the result is that this study could to some extent be pioneering in raising this issue.

CONCLUSION

In terms of what CE teachers and learners think of iPad-based M-learning, the first ground breaking finding was that CE people's attitude towards iPad-based M-learning are more objective and rational than those who are not engaged in CE. The second finding was that the CE teachers were generally positive about the benefits of iPad-based M-learning in terms of improving or changing learning. This study also challenges previous claims that the outcomes of M-learning are difficult to assess and thereby advocates a case by case assessment of the outcomes

of M-learning. The claim that mobile technology cannot change learning but is instead just another component of learning resource is also disputed by this study; which claims that the iPad as learning resource can change learning as a whole. The limitations of iPad-based M-learning in this study largely relate to the specific context of CE. Some of the limitations are consistent with previous research, but others were first discovered. In terms of how people are trained and supported to use iPad-based M-learning in CE, school policies like iPad 'buy back' policy, the Wifi environment, on-line interactive forum, were all found to contribute to the support for iPad-based M-learning. Another supportive aspect of this is teachers' belief in iPad-based M-learning and their expectations of students. In terms of training, the research participants had not received formal training in iPad use at the school, but teacher-student communication, and self-training played an important role in 'in-use' training. However, this research is not without limitations; in particular, due to the limited sample and the case study method, the statistical generalisability of the study is limited. Due to the time allocated to observing the CE class, it was difficult to attain a comprehensive picture of how the iPad is used. In addition, as the participation of both teacher and student participants was arranged by school, the Hawthorne effect may have potentially influenced responses, influencing trustworthiness. While this study has to some extent answered the research questions set; in order to understand better how iPad-based M-learning is used in the PBL, a longer observation period or ethnographic research would be desirable in the future.

ACKNOWLEDGEMENT

The authors would like to express gratitude to Professor David Wray, from the Centre of Education Studies, The University of Warwick, for his suggestions and supervision. This study was funded by then the Institute of Education, the University of Warwick.

REFERENCES

Adams, R.S. and Felder, R.M. (2008) 'Reframing professional development: A systems approach to preparing engineering educators to educate tomorrow's engineers', *Journal of Engineering Education*, 3(97), 239-240.

Arksey, H. & Knight, P. (1999). *Interviewing for Social Scientists*. London: Sage.

Attewell, J. (2005) *Mobile technologies for learning*, London, UK: Learning and Skills Development Agency.

Bassey, M. (2012). 'Case studies' in Briggs, A. R. J., Coleman, M and Morrison, M. (Eds.) *Research Methods in Educational Leadership and Management*. London: Sage, 155-69.

Beetham, H., & Sharpe, R. (2007). Design for Learning: Rethinking Pedagogy for the digital age. *London: Routledge*.

Biederman, I. and Vessel, E.A. (2006) 'Perceptual Pleasure and the Brain', Sigma Xi, *The Scientific Research Society*. May-June, 249-255.

Bowen, J. A, (2012). *Teaching Naked: How Moving Technology Out of Your College Classroom Will Improve Student Learning.* San Francisco: Jossey-Bass.

Brand, J., Kinash, S., Mathew, T., & Kordyban, Ron, (2011). iWant does not equal iWill: Correlates of mobile learning with iPads, e-textbooks, BlackBoard Mobile learn and a blended learning expereince, in G. Williams, P. Statham, N. Brown, and B. Cleland (eds.), *Changing Directions. Proceedings ascilite 2011 Hobart: Full Paper*, 168-178.

Bush, T. (2012). Authenticity in research: reliability, validity and triangulation, in Briggs, A, R, J, et al. (Ed.), *Research methods in educational leadership & management.* London: Sage.

Cochrane, T. & Narayan, V., and Oldfield, J. (2013). iPadagogy: appropriating the iPad within pedagogical contexts, *Mobile Learning and Organiastion*, 7(1). 48-65.

Cohen, L.; Manion, L. & Morrison, K. (2011). *Research method in education*. London: Routledge.

Churchill, D. (2005) 'Teachers' private theories and their design of technology-based learning', *British Journal of Educational Technology*, 37(4), 559-576.

Churchill, D., Fox, B., & King, M, (2012) Study of Affordances of iPads and Teachers' Private Theories, *International Journal of Information and Education Technology*, 2(3). 251-254.

Frank, C. (1999). *Ethnographic Eyes: A Teacher's Guide to Classroom Observation*. USA, Portsmouth: Heinemann.

Garcia, E. R. (2011). "There's an App for That:" A Study Using Apple iPads in a United States History Classroom, in McCoy, L. P. (eds.), *Studies in Teaching 2011 Research Digest:Action Research Projects Presented at Annual Research Forum.* Available at: http://www.wfu.edu/education/gradtea/forum2011/research.proceedings.2011.pdf Accessed on 18/7/2013

George, S., & Serna, A. (2010). Introducing mobility in serious games: Enhancing situated and collaborative learning, in J. Jacko (eds.), *Human-computer interaction: Users and applications*. New York: Springer Science and Business Media.

Gillham, B. (2005). *Research Interviewing: The Range of Techniques*. Maidenhead: Open University Press.

Gould, J. (2012) *Learning Theory and Classroom Practice in the Lifelong Learning Sector*. London: Sage.

Hartnell-Young, E., & Heym, N. (2007). Challenging Practice: Researching mobile phone use for learning in secondary schools, *Learning and Research Institute Seminar*, 20th Nov 2007, University of Nottingham, UK (seminar).

Jardine, D., Friesen, S., & Clifford, P. (2008). *Back to the Basics of Teaching and Learning: Thinking the World Together*, 2nd Edition. New York: Routledge.

Jahnke, I. (2011) 'How to Foster Creativity in Technology Enhanced Learning?', in B. White, I. King, and Ph. Tsang (eds.), Social Media Tools and Platforms in Learning Environments: Present and Future. Springer, 95-116.

Kinash, S. (2011). It's mobile, but is it learning? *Educational Technology Solutions*, 45, 56-58.

Klopfer, E., Squire, K. and Jenkins, H. (2002) *Environmental detectives PDAs as a window into a virtual simulated world*. Paper presented at International Workshop on Wireless and Mobile Technologies in Education.

Klopfer, E., Perry, J., Squire, K., Jan, M. F., & Steinkuehler, C. (2005). Mystery at the museum: a collaborative game for museum education. In *Proceedings of the 2005 conference on Computer support for collaborative learning: learning 2005: the next 10 years!* (pp. 316-320). International Society of the Learning Sciences.

Li, X.P.K. (2012) *Impacts of iPad Attributes, Users' lifestyles, and Media Dependency on the adoption and Intensity of iPad Usage*. Available at: http://pg.com.cuhk.edu.hk/pgp_nm/projects/2012/Li%20Xinpeng%20Kevin.pdfAccessed on 18/7/2013

Le Merrer J, Becker, JAJ, Befort K, and Kieffer BL (2009) 'Reward Processing by the Opioid System in the Brain', *Physiological Review*, 89(4), 1379-1412.

Marra, R.M., Palmer, B., Ulseth, R., & Johnson, B. (2011). The iron range engineering PBL curriculum: How students adapt to and function within PBL, in Davies, J., Graaff, E., and Kolmos, A. (eds.), *PBL across the disciplines: research into best practice.* Aalborg University Press.

McCraty, R. (2002) 'Influence of Cardic Affluent input on Heart-Brain Synchronisation and Cognitive Performance', *International Journal of Psychophsyiology*, 45 (1-2), 72-73.

McCraty, R., Bradley, R.T., and Tomasino, D. (2005) 'The Resonant Heart', *Shift: at the Frontiers of Consciousness*. 15-19.

McFee, G. (1992). Triangulation in research: two confusions. *Educational Research*, 34 (3), 215-219.

Melhuish, K. & Falloon, G. (2010). Looking to the future: M-learning with the iPad, *Computers in New Zealand Schools: Learning, Leading, Technology*, 22(3), 1-16.

Morris, N. P., Ramsay, L., & Chauhan, V. (2012). Can a tablet device alter undergraduate science students' study behavior and use of technology? *Advances in Physiology Education*, 36, 97-107.

Morse, J, M. (2004). Nominated sampling, in Lewis-Beck, M, S. et al. (Ed.) *The Sage encyclopedia of social research methods*. London: Sage.

Motiwalla, L, F. (2007). Mobile learning: a framework and evaluation, *Computers & Education*, 49, 581-596.

Naace (2011). *Naace, Advancing education through ICT*. Available at: http://www.naace.co.uk/Accessed on 18/7/2013

Newby, P. (2010). *Research methods for education.* Essex: Pearson Education Limited.

Nisbet, J. & Watt, J. (1984). Case study, in J. Bell, T. Bush, A. Fox, J. Goodey and S. Goulding (Eds.) *Conducting Small-Scale Investigations in Educational Management.* London: Harper and Row, 79-92.

Oldfield, J., & Herrington, J. (2012). Mobilising authentic learning: Understanding the educational affordances of the iPad. URL: http://www.ascilite.org/conferences/Wellington12/2012/images/custom/oldfield,_james_-_mobilising.pdf Access at 12/Sep/2016.

Pajares, F. (1992) 'Teachers' beliefs and educational research: Cleaning up a messy construct', *Review of Educational Research*, 62, 307-332.

Peters, K. (2009). 'M-learning: Positioning educators for a mobile, connected future', in M. Ally (Ed.), *Mobile learning: Transforming the delivery of education and training*. Vancouver: Marquis Book Printing.

Sadlo, G. (2011) 'Learing through problems: Perspectives form neuroscience', in Davies, J., Graaff, E., and Kolmos, A. (eds.), *PBL across the disciplines: research into best practice.* Aalborg University Press. Available at: http://vbn.aau.dk/files/57931848/PBL_across_the_disciplines_research_into_the_best_practice.pdf Accessed on 18/7/2013

Robson, C. (2011). *Real world research.* Hoboken: John Wiley & Sons.

Rubie-Davies, C. (2008) 'Teacher expectations', in T.Good (eds.), 21st century education: A reference handbook. Thousand Oaks, CA: SAGE Publication, Inc. doi: 10.4135/9781412964012.n27

Savin-Baden, M. (2007). *A practical guide to problem-based learning online*. London: Routledge.

Sharples, M., Taylor, J., & Vavoula, G. (2007). A Theory of Learning for the Mobile Age. In R. Andrews and C. Haythornthwaite (eds.), *The Sage Handbook of E-learning Research*. London: Sage, 221-47.

Traxler, J. (2010). Will Student Devices Deliver Innovation, Inclusion, and Transformation? *Journal of the Research Centre for Educational Technology*, Vol 6, No 1, pp.

Wakefield, J., & Smith, D. (2012). From Socrates to Satellites: iPad Learning in an Undergraduate Course, *Creative Education*, 3(5), 643-648.

Wang, Y.S., Wu, M.C., and Wang, H.Y. (2009) 'Investigating the determinants and age and gender differences in the acceptance of mobile learning', *British Journal of Educational Technology*, 40 (1), 92–118.

Wray, D. (2011) 'iPads in education: the beginning of a revolution?', *Journal of Reading, Writing and Literacy*, 5 (1).

Issues and Impediments Faced by Canadian Teachers while Integrating ICT in Pedagogical Practice

Anoop Saxena
Department of Educational and Counselling Psychology, McGill University, Canada
anoop.saxena@mail.mcgill.ca

ABSTRACT
Teachers in many schools struggle to integrate Information and Communications Technology (ICT) as part of their teaching practice. Among the issues faced by teachers when attempting to integrate ICT into their classrooms are gaps in ICT knowledge and skills, lack of training and inadequate support and scaffolding. Other issues include inability to translate training into pedagogical practice and curriculum design and lack of access to current hardware and software. Research in the field addresses the exponential pace of technology development and obsolescence as well as the financial and educational implications of teaching and learning in such an environment. Teachers are core to the integration of ICT in the classroom and hence are often under pressure, since ICT integration is not just about having the right hardware and software; it is deeper and covers many layers. Integrating ICT requires a harmonious synchronicity of content, teacher knowledge, compatible theoretical framework and suitable pedagogy all at the appropriate stage of knowledge acquisition. This review explores the current obstacles to ICT integration in the Canadian classroom as well as the issues faced by educators related to these obstacles.

Keywords: Review, ICT integration, ICT issues, Pedagogical practice, Barriers

INTRODUCTION
Since the advent of the personal computer and the beginning of the Information Age in the 1970's, there has been a continuous effort to introduce new technologies into teaching and learning in education. The approval of Information and Communication Technology (ICT) integration universally in the education system has frequently been touted on the assumption that technological implementation and changes will improve and transform the system and provide students with a stronger position to deal with working in the information age. Pelgrum (2001) suggested that ICT is considered to go beyond providing the infrastructure for the Information Society to serving as a medium for reform that converts students to 'productive knowledge workers' (p.163).

Scholarly research in this area confirms the belief that the implementation of ICT in science and mathematics education can help improve students' problem solving skills, theoretical understanding, and group productivity skills (Culp, Honey & Mandinach, 2005; Tao & Gunstone, 1999). Eggen and Kauchak (2003) observed the advantages to students on an internal level and suggested that technology can elucidate motivation in learners by compounding self-efficacy and self-esteem, increasing attendance, fostering goodwill towards educational institutions, eagerness towards activities outside classroom and more student participation in learning activities (p.420).

On an external level, the benefits to students were noted by the International Confederation of Principals (ICP) (2003) as the ability to transcend time and space in transforming learning both inside and outside the classroom (p.1). Among additional perceived benefits to learners that the principals noted were quick access to enormous amounts of information, global access to quality material, opportunities to interact with peers and experts without any geographical restrictions. Also noted were the possibility of experimenting with simulations and working with a variety of tools appropriate for diverse learning styles. Similarly, Dhanarajan (2002) summarized benefits for learners suggesting that an enhanced and personalized learning milieu that caters to the desired pace, peers and place of learning can be brought about using the tools of ICT like email, internet, audio-visual media, and computing (p.74). These tools and opportunities were previously unavailable to educators until the 1990's.

Although continuous effort on a global scale has been committed to the integration of ICT in education, Goktas et al. (2013) suggested that integration issues do arise from time to time and are sometimes challenging. It should also be noted that ICT does not cater to all the educational needs. In fact, if used incorrectly, it could create problems and add to those previously present (ICP, 2003). In order to integrate ICT in the classroom environment, a number of factors need to be aligned for a successful ICT setup. These include, appropriate hardware and software, computers proportional to the number of students, teacher understanding and

commitment to the technology as well as ICT appropriate teaching methods and techniques (Becta, 2004; UNESCO, 2004). The complexity increases when there are blurred lines between what each school means when they refer to ICT integration (Hadjerrouit, 2009).
Hadjerrouit (2009) referred to Rautopuro (Rautopuro et al., 2006; Webb, 2002), in suggesting three facets ICT in school education:

a) The use of ICT to support teaching and learning processes, using word processors, spreadsheets or databases in disciplines like mathematics or science.
b) The provision of educational materials like LMS (Learning Management System) or Web-based learning to create a learning environment in order to facilitate learning through ICT.
c) To learn the processes, concepts, skills, and knowledge of ICT as a discipline in itself (p.155).

Schools (K-12) are under pressure to implement all the three aspects of learning ICT, however with limited support, this goal is not always possible and mostly ICT integration is a balancing act by implementing some of each of the three aspects. Frequently in schools, there is a mismatch between the availability of finances to purchase the technology and the price of current technologies available in the market. This problem is amplified because "digital technologies morph and change quickly at a rate that generally outpaces curriculum development" (Johnson et.al., 2011, p.4). With limited budgets and dwindling government support (http://www.cbc.ca/news/canada/nova-scotia/story/2012/02/10/ns-school-boards-funding.html; http://www.thestar.com/news/gta/education/article/1210468--toronto-and-peel-school-boards-prepare-for-biggest-cuts-since-harris-years), a number of schools set their ICT policies and type and level of integration based on what they can afford. This situation puts tremendous pressure on teachers who are expected to flawlessly integrate ICT in their classrooms under such conditions.

To further confound the issue, teachers vary in their background and approach to ICT (Nikolopoulou & Gialamas, 2016). Research in this area shows that in a significant number of schools, the potential of learning with ICT is lost as several educators still have gaps in their ICT knowledge and hence do not use ICT in their teaching despite its apparent benefits for educational purposes (Bingimlas, 2009; Pelgrum, 2001; UNESCO, 2004). Another problem is that teachers are very seldom consulted when ICT policies are developed and their subsequent integration recommended. When this oversight happens, teachers are unable to develop a positive attitude towards ICT and hence reject the applicability of ICT in their teaching practice (Hammond, 2014; Watson, 1998; Woodrow, 1992).

The National Teacher Survey (2005) of teachers based in the United States showed that only about 54% teachers integrate computers into daily instruction and just about 25 % believed that their training was adequate enough to use recent instructional software packages. Another noteworthy point was that just 21% of teachers thought that they had had adequate professional development training in the use of assessment software. Ertmer (1999) suggested that teachers' classically entrenched core beliefs are resistant to change and therefore impact fundamental change. The analogous reality is that educational change is reliant on "what teachers do and think – it's as simple and as complex as that" (Fullan, 2007, p.129). The point being that the role of the teacher influences educational technology. Teachers' perception of and response to technology, and also their use of educational technology to achieve their intended outcomes will affect its future employment within the classroom (Roblyer, 2003 in Magliaro & Ezeife, 2007). McGehee and Griffith (2004) recommend that educators need to incorporate new technologies into their teaching so that they can maximize the potential benefits of ICT, resulting in improved student performance.

One of the elements impacted by the reduced financing capability of the school is student-computer ratios. A higher student-computer ratio in the classroom has been noted as a barrier to successful ICT integration (Pelgrum, 2001; Statistics Canada, 2005; U.S. National Teachers Survey, 2005; Korte & Hüsing, 2007; Bingimlas, 2009). However, all is not lost here, since studies have shown that increasing the number of computers showed no significant relationship to student performance (Hu, 2007; Lei, 2010). So the issue then boils down to 'optimal' usage of the technology on hand.

Shared use of computers has been the reality since microcomputers were introduced into classrooms. Developmental and learning theories suggest that social interaction and peer support can stimulate learning and help in knowledge building. In the normal course of life, we gain knowledge through peer interaction and based on evidence, "under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them" (Surowiecki, 2004, p.xiii). Hence, to support optimal learning using ICT, if we use a carefully planned approach instead of simply placing students together in groups, we should be able to achieve a successful learning environment that could potentially be richer than an individualized learning environment.

Keeping the benefits, obstacles and research-based realities of integrating ICT in mind, my research looks at ways in which educators can address some of the issues and support the integration of ICT in classrooms that have limited ICT infrastructure.

STATEMENT OF PURPOSE

The purpose of this study was to explore current obstacles to ICT integration in the classroom as well as the issues faced by educators related to these obstacles. Research in the areas of technology and obsolescence, classroom student-computer ratios and teacher perspectives on the integration of ICT was gathered and analysed.

REVIEW

This review examines the impact of technology on ICT integration in K-12 schools as well as research in the area of school and teacher issues and attitudes towards the integration of computer technology in teaching practice.

Literature Selection Process

In order to conduct a detailed systematic search of the research literature on impact of technology on ICT integration in K-12 schools, multiple electronically available databases were selected and searched to identify all published studies relevant to the topic (Cook & West, 2012). Indexing databases selected for this search were Educational Research Information Center (ERIC), Psychological Information (PsycINFO), Scopus, and Web of Science. The following keywords were used in the literature searches: ICT integration, ICT issues, pedagogical practice, K-12 schools, Canada and review. Papers yielded by the searches were initially screened for inclusion based on their title, followed by a review of the abstract. However, not all studies generated by the electronic search were reviewed as further criteria were used to screen their suitability.

The inclusion criteria were that:

(i) they were a review or meta-analysis or a study in the area of ICT integration in K-12 schools and that they were from a peer-reviewed source;
(ii) they reported on ICT integration in K-12 schools or research in the area of teacher issues and attitudes towards the integration of technology in teaching practice; and
(iii) only documents published in English were used (to focus on directly usable material)

and the exclusion criteria were:

(i) unpublished theses, dissertations or presentation abstracts that were not published in peer-reviewed journals (grey literature);
(ii) reviews they were simply descriptive; and
(iii) not clearly linked to the concepts under review or parallel lines of research in other areas

TECHNOLOGY AND OBSOLESCENCE

"The only big companies that succeed will be those that obsolete their own products before someone else does" Bill Gates - Founder, Microsoft Corp.

The computer industry frequently and unfailingly launches products that are smaller, more powerful and less expensive than their predecessors. This stems from the conviction that every piece of technology so far, (hardware and software) is affected by Moore's law which states that "The number of transistors incorporated in a chip will approximately double every 24 months" (Intel, 2005). Moore's law predicts and is valid to the way technology is advancing. However, does that mean that we 'need' the latest (better and smaller) technology in education to teach the basic concepts of other (non-computing) fields like Biology, History and so on?

There are other factors at play and not just the fact that technology is moving at a rapid pace. Among these factors is the concept of 'planned obsolescence'. Planned obsolescence is a term that can be traced back to 1932 with Bernard London's pamphlet '*Ending the Depression through Planned Obsolescence'* in which right at the beginning (even before a product is manufactured) the idea is to deliberately make sure that the product's useful life is limited. This causes the consumer to feel the need to purchase newer products as replacements for the older 'obsolete' ones. In the technology industry, Sandborn (2007) suggested that hardware and software have developed a symbiotic relationship where hardware enhancements trigger software manufactures to make their software obsolete in relation to the hardware technology. This situation in turn causes older hardware to become out-dated. For example - CorelDraw X5 needs a minimum processing power of Intel® Pentium 4, AMD Athlon 64 or AMD Opteron. But a Intel® Core™ Duo 1.83 GHz, AMD Dual-Core 2.0 GHz or higher is required for video editing (Corel Corporation).

Hindle (2008) conceptualized this software/hardware relationship using the analogy of children being born with the ability to speak a language that they understood but their parents could not, yet being able to understand the language of their parents. Similarly, new versions of software can understand and communicate with previous

generations of the software but communication in the opposite direction may not always be possible, thus reducing the utility of older versions in time (p.147).

As an example of hardware requirement changes necessary for running the newer software, in the older version of Windows Operating System (OS), Windows 98, the minimum memory requirements were 64MB, which now have increased to 1GB (1024MB) for the Windows 7 version. Similarly highlighting the case of changes in newer and improved software, for example, let us examine the differences in the Microsoft program – Word (a type of document typing and editing software). Between the product's first launch in 1989 and the following 10 years, the number of toolbars went from 2 to 23, to 31 in another 4 more years and more in the following years! So by the time people are trained to understand the workings of the new software, the newer one is launched or ready to launch, starting the whole process of training again.

Aronson (2008) confirmed that by the time many of us get our hands on the latest piece of technology, there is already the successor (or replacement) getting ready to roll out of the manufacturing plant. Hence, the major concern with adopting new technology in schools is that it puts an incessant strain on the limited budgets and dwindling resources often leaving a significant number of schools with either obsolete technology or high computer to student ratios for new technology. With technology advancing and rapidly getting obsolete, for schools, there is an emergent widening gap between the integration of advanced technology and teaching and learning. For teachers, it becomes a challenge to integrate this ongoing advancement into the classroom, which in turn impacts the student.

CURRENT SETUP IN SCHOOLS

According to the Merriam-Webster dictionary, a Personal Computer (PC) is defined as: "A general-purpose computer equipped with a microprocessor and designed to run especially commercial software (as a word processor or Internet browser) for an individual user". The key terms I wish to highlight here are 'personal' and 'individual'. Both terms confirm the fact that the PC is a single user machine and has not been designed for the use of more than one user. However, this has not been the case since the introduction of microcomputers in schools, and even today many schools allocate a single PC to multiple users.

Schools are under pressure to allocate significant time and money for integrating technology into curriculum, with the prime intent of improving student academic achievement (OECD, 2001; Plante & Beattie, 2004; U.S. Department of Education, 2000). Since teachers are fundamental to any integration plan, they have been under pressure to learn technology skills and then teach by incorporating ICT into their practice. However, current trends of increasing budgetary constraints and projected economic conditions make it difficult for a large number of educational establishments to provide this technology adequately to their students (Ali, 2007; Zhao et al., 2002).

Validating the costs associated with technology acquisition, in a significant number of schools, it is unlikely that the PC is used 'individually'. According to Ertl and Plante's (2004) report, published by Statistics Canada, in 2003/04 about 72 computers per school were used for educational purposes. With a median of 12 minutes per school computer dedicated to support and maintenance each month, the number of working PC's for use available at one time for teaching drops below the average of 72 computers per school. Also, less than 25% of the K-12 schools in Canada were operating with around 50% of their PCs running the most recent Operating System (OS), with Quebec and the Atlantic provinces trailing the list (Statistics Canada, 2004).

Research surveying educational practitioners, over a number of countries spread across continents, identified that an insufficient number of computers hindered the integration of computing technology in schools (Bingimlas, 2009; O'Mahony, 2003; Pelgrum & Law, 2003). Similarly, Mumtaz (2000) reported similar results and further suggested that both an insufficient number of computers and improper software can significantly impact the implementation of ICT. Recently, Nikolopoulou & Gialamas (2016) found that lack of equipment was a key issue in Greek classrooms as well. Under these conditions, options for appropriate technology use are reduced, hindering the opportunities available to the quality use of ICT in the classroom.

Can it be assumed that if a sufficient number of computers are made available with appropriate software, then we should be able to integrate ICT in schools easily? Fabry and Higgs (1997) noted that the appropriate amount and right types of technology along with adequate access is vital for the effective integration of computers and that a suitable numbers of computers alone does not assure proper utility of the technology. This issue is echoed by Zhao et.al. (2002) who state that; "Although in recent years there is a great progress in bringing computers and networks to schools, we found that in many schools teachers did not have easy access to either of the two infrastructures" (p. 512). Based on observations of the above mentioned researchers, it can be said that if

teachers have poor access to technology, it will be reflected in their integration of ICT and teaching. Norris, Sullivan and Poirot (2003) point out the importance of accessibility for teacher's use as: "…teachers' use of technology for curricular purposes is almost exclusively a function of their access to that technology" (p. 25).

Although we can contend that access is key, once the technology is available in the school, however, researchers have identified more facets of the issue and highlight a number of other equally vital factors that weigh in similarly with regards to the integration of ICT in schools. According to Becta (2004), improper organisation of resources, low quality hardware, inappropriate software, or lack of access each can impact the ICT usage in schools. The report *'Integrating ICTs into education'* by UNESCO (2004) cites that "The integration of computers and technology into schools is an expensive and sometimes complex process. It requires all the necessary equipment, competent staff to get it up and running, technical support, and teaching of others to use it correctly and effectively"(p.7).

In Nova Scotia, the 'Computers for Schools' program operates where people and businesses can donate their used but still useable computer equipment to the program. The point to note here is that most of the equipment is older and has been used. Assuming that planned obsolescence is a factor, the equipment should be reaching a point where it has 'lived its life' and hence the possibility of equipment failure or breakdown starts to increase. Bennett (2011) claimed that "Nova Scotia has 60,000 computers in a system serving 127,000 students, many of which badly need replacement" (online report). This claim is validated by the Nova Scotia Department of Education in their ICT report (2005) which states that "In Nova Scotia, 77 technicians support approximately 40,000 computers (a ratio of worse than 1:500)" (p.9). Findings by Preston, Cox, and Cox (2000) as well as the British Educational Suppliers Association-BESA (2002) suggested that when the equipment available is old and less reliable, teachers tend not to embrace using ICT in teaching.

STUDENT COMPUTER RATIOS

In his survey on educational practitioners' views in 26 countries (from the continents of North America, Oceania, Asia, Africa and Europe), Pelgrum (2001) identified that the top barrier to successful implementation of Information and Communication Technologies (ICT) in schools was an insufficient numbers of computers. This sentiment was echoed in the United States by the National Teachers Survey (2005) which found that 62% teachers responded to not having the right computers to student ratio in their classrooms.

According to research conducted by Wastiau, Blamire, Kearney, Quittre, Van de Gaer and Monseur (2013) covering 27 European countries, they observed that in schools in Europe, a computer is shared on an average between 3-7 students. In Canada, the school median is 5 students per computer (Statistics Canada, 2005). This number still falls short of the research suggestions by Corbett and Wilms (2002), that recommended that ratios better that one computer per four or five students, are necessary to ensure significant improvements in learning. However, for essential practices to be fundamentally changed, DiSessa (2000) suggested that the critical ratio is one computer per three students. According to the US National Teachers Survey (2005), only 13% of teachers had one computer to two or three students in their classroom.

Fabry and Higgs (1997) found that a large number of schools highlighting their low student to computer ratio had a significant number of computers that did not provide easy access for learning and were of poor hardware and software specification. Agyei and Voogt (2014) echo this and suggested that limited technological resources in schools present themselves as a key barrier to the integration of ICT in classrooms. This situation makes us question the value of such low ratios, since such dated technology and incompatible software specification would not be able provide the improvements suggested by Corbett and Wilms (2002) and DiSessa (2000) in learning. More recently, Larkin (2011) questioned the optimal one computer per student ratio recommending instead that one computer be available for every two students. His research suggested that "1:2 computing is preferable to 1:1 computing to achieve a balance between productivity, student engagement, social activity, and individualised learning" (p.101).

Studies have shown that increasing the number of computers showed no significant relationship to student performance (Hu, 2007; Lei, 2010). However, Lei's (2010) study also suggested that "for technology to have meaningful impact on teaching and learning, close attention must be paid on the quality of technology use: how is it being used, what is used and for what purposes" (p.468).

TEACHER INTEGRATION OF COMPUTING TECHNOLOGY

McGehee and Griffith (2004) recommended that educators need to incorporate new technologies into their teaching so that they can maximize the potential benefits of ICT, resulting in improved student performance. The

Algemeen Directeurenoverleg Educatieve Faculteiten (ADEF) (2009) suggested that a teacher should be proficient and competent in key areas in order to integrate ICT in the classroom. These key areas were:

1. Instrumental skills

The teacher has enough technical or operational skills required for the use of a computer in order to employ ICT in lesson situations and in educational organisation.

2. Information skills

The teacher is knowledgeable about media and skilled regarding information.

3. General pedagogics

The teacher makes appropriate use of ICT in lessons and is able to combine digital and non-digital teaching materials (blended learning), to make learning more effective and/or efficient.

3.1. Presenting

The teacher is adept in integrating digital material into lessons and can employ varying pieces of hardware to achieve desired educational outcomes.

3.2. Collaborating and communicating

The teacher is familiar with a number of synchronous and asynchronous digital forms of communication and is able to employ these in the lessons.

3.3. Working individually

The teacher is able to guide students working independently with ICT.

3.4. Guiding and evaluating

The teacher is able to use ICT in teaching and evaluating students. To this end the teacher is capable of gaining insights into the student's learning using ICT.

3.5. Testing

The teacher is able to develop/compile, administer and evaluate simple digital tests.

4. Designing and developing

The teacher can use ICT for designing and /or developing digital teaching material. (p. 3-6)

However, research in this area showed that in a significant number of schools, the potential of learning with ICT was lost as several educators still have gaps in their ICT knowledge and hence do not use ICT in their teaching despite the apparent benefits of the use of ICT for educational purposes (Bingimlas 2009; Pelgrum 2001; UNESCO 2004). The US National Teacher Survey (2005) showed that slightly over half (54%) of teachers integrate computers into daily instruction and just about a quarter of them thought that their training was adequate enough to use current instructional software packages. Professional development training in the use of assessment software was perceived as adequate by only 21% of teachers. These statistics suggest that a majority of teachers might resist adopting technology-related practices.

Research by Barak (2006) suggested that teachers are cautious about integrating advanced technologies in schools even though they take advantage of ICT for their personal development and learning. The reason that teachers are cautious can also stem from research like Slaouti & Barton (2007) who observed that hindrances such as time pressures, accessibility of equipment, lack of mentors and opportunities for apprenticeship or observation also have an impact on teachers' ability to integrate ICT. Globally, researchers believed that integrating ICT for instructional purposes eventually rests on the attitudes of teachers toward the technology (Huang & Liaw, 2005; Teo, 2008). In the case of learning environments, technology optimization should not be the 'holy grail'. For instance, although there are potential benefits of using ICT in teaching and learning, one should bear in mind that the value of knowledge that can be imparted and gained on its own with limited use of technology is valuable. This sentiment is echoed by the President's Panel on Educational Technology (1997) who suggested that lessons using ICT should "emphasise content and pedagogy, and not just hardware" (p.8). That is, the focus when implementing ICT might shift from student learning and achievement to the state and capability of the technology. Such a focus would need to be examined critically.

Earlier research in this area of teacher integration of ICT in the classroom still shadows some of the current issues faced. Hodas (1993) talked about "technology refusal" by teachers, identifying concerns that teachers sometimes fear both technology and loss of control that might result from increasing technology use in the class. Tying these concerns in with current research by Tella et al. (2007), it was found that "inadequate knowledge to evaluate the role of ICT in teaching and learning, lack of skills in the use of ICT equipment and software had resulted in a lack of confidence in utilising ICT tools" (p.14). So since 1993, limited changes have occurred in regards to some of the factors identified as hindrances to the integration of ICT by teachers.

Some of the key factors like teacher attitude, experience, knowledge, training and integration of ICT into the curriculum are discussed in detail next. These factors can be either facilitators or hindrances. In Canada,

according to Statistics Canada, the usage and acquisition of ICT by teachers is in line with research in other jurisdictions.

Table 1 presents the most recent data collected by Statistics Canada in the context of teacher ICT development. It shows the percentage of schools that promote teachers' understanding of ICT and the techniques they use in helping them learn and integrate the technology in their practice.

Table 1: Strategies to Help Teachers Learn How to Use ICT

	Mentoring or coaching activities with teachers or ICT professionals	**Information-sharing or discussion with staff**	**Personal learning activities**	**Professional development**	**Training sessions**	**Staff meetings**	**Organized after-school sessions**
	% of schools						
Canada	**25.1**	**18.2**	**14.6**	**12.8**	**12.2**	**8.0**	**7.2**
Newfoundland and Labrador	17.3	12.7	6.6*	7.8	6.1*	4.4*	X
Prince Edward Island	27.4	17.4*	X	13.6*	x	x	X
Nova Scotia	21.0	16.1	16.4	11.9	10.2	5.5	5.5
New Brunswick	20.4	12.6	12.0	10.0	12.3	7.6	8.7
Quebec	30.9	16.8	20.6	11.7	19.3	10.2	9.8
Ontario	24.9	21.4	12.6	13.1	10.6	8.6	7.1
Manitoba	24.9	16.9	14.5	14.0	14.8	5.6	4.9
Saskatchewan	19.7	13.9	12.0	10.9	10.4	5.3	6.4
Alberta	31.3	21.8	17.3	20.2	13.0	9.0	8.8
British Columbia	17.8	12.8	11.2	8.5	7.0	5.7	4.0
Yukon	33.3	33.3	X	X	x	x	X
Northwest Territories	X	x	X	X	x	x	X
Nunavut	X	x	X	X	x	x	X

Note: Estimates reflect the answer category 'a lot of emphasis placed by principal on strategies to help teachers learn how to use ICT'.
* Lower reliability estimates due to sample size.
x Suppressed to meet confidentiality requirements of the *Statistics Act*.

(Source: Information and Communications Technologies in Schools Survey 2003/04, Centre for Education Statistics, Statistics Canada, p.26)

Beliefs and attitudes

Embracing and integrating ICT in the classroom can be strongly influenced by the teachers' attitudes towards ICT (Chai et. al., 2009; Drent & Meelissen, 2008; Jimoyiannis & Komis, 2007). Kulik, Kulik and Bangert-Drowns (1985) conducted a meta-analysis of 32 comparative studies on the impact of computer-based instruction on elementary school students' achievement. This earlier research focussed on the student rank and achievement. Factors such as teacher's attitude and level of integration were given less weight at that time. These factors are now being highlighted in current research and acknowledged as having a significant impact on student learning.

Recent research into the barriers to ICT integration in schools highlights that teacher attitude is not just a personal dynamic, but it is strongly influenced by the support and scaffolding available to the teacher in terms of implementing ICT. This support and scaffolding also demonstrates itself in the form of access and failure rates of available equipment, the opportunities for training given and the school philosophy towards the integration

and application of ICT in the environment. (Becta, 2004; Dawes, 2001; Ertmer, 2005; Mumtaz, 2000). For example, a teacher who is hindered by the failure of equipment on a number of occasions might reduce their integration of ICT in their teaching. When assessed, this situation can reflect as a negative attitude towards the integration of ICT. Nikolopoulou & Gialamas (2016) echoed the research by Awan (2012) and noted that factors such as access to equipment, training, and the support of the education community, played a huge part in the attitude the teacher had and their inclination to integrate the ICT in their practice.

Teacher's attitudes in integrating ICT also have an impact on the attitude of the students towards ICT. Sime and Priestley (2005) in their research found that "individual teachers were also perceived as having the power to model children's attitudes towards ICT and their attitude in this sense was considered as crucial. When teachers were enthusiastic and dedicated to finding ways of using ICT in teaching, and gave pupils meaningful tasks on the computer, pupils were thought to be more involved in their learning with ICT" (p.137). Their research also found that "even when resources were limited and access to computer suites was problematic, students thought that the individual teachers' attitude was the vital factor in determining ICT use" (p.137).

Teacher's attitudes and beliefs are fundamental for the successful integration of ICT in education. However, they are not standalone factors in the integration of ICT. A positive attitude towards ICT along with the right support and scaffolding for the institution can go a long way in the successful application of ICT in schools.

Knowledge and experience

Pelgrum (2001) cited lack of skill and/or knowledge as well as issues with integrating ICT into the lesson, as the top non-material hindrances to developing a successful ICT school environment. These hindrances could be explained in the research completed by Oren, Mioduser, and Nachmias (2002) who noted that teachers had limited knowledge of integrating ICT into their practice since "… most current teachers' pre-service preparation, and subsequent in-service courses were devised in reference to traditional educational technology and settings (e.g., printed materials, frontal lectures, and face-to-face group work)" (p.15).

According to Oblinger and Oblinger (2005), most of the children born in and after the 1980's belong to the 'Net Generation' (a term coined by Don Tapscott in 1997) where the use of technology and the internet were part of the environment growing up. Being exposed to ICT earlier on in their childhood makes technology an embedded part of the children's thought process. This experience is in contrast to that of teachers who may not have had such an exposure and have to acquire this technology and the various aspects of the technology from the ground up.

The issue confounds itself when teachers who don't have technical backgrounds have to integrate technology and achieve a level of proficiency in using the ICT. Montgomerie and Irvine (2001) noted that when schools employed graduates with a higher qualification in education, it was expected that they have a reasonable level of ICT knowledge and exposure to ICT implementation. Even in the case where the teacher may have had a formal training in Instructional technology, there is a very high chance that they have little to no knowledge on how to translate that training into their teaching practice and curriculum design (Bauer, 2000; Hardy, 2003). The problem here is that even though the teachers' are entering the schools with a comprehensive grounding in their core subjects as well as training in ICT, there is a possible disconnect between their knowledge and successful integration of ICT with the subject matter and the subsequent presentation of that material for teaching.

The way this can be represented is in the form of an inverse pyramid (Figure 1). At the top, academic knowledge and prior experience along with teaching skills form the foundation of the pyramid. This foundation (in many of the current school systems) is enriched with ICT training (so that ICT can be integrated with the teaching).

Figure 1: *Knowledge Pyramid*

However, the final application and integration of ICT is heavily reduced and is not a cumulative effect of the merger of the two prior factors of foundational knowledge and ICT training (which ideally it should represent). In other words, ICT training that fails to focus specifically on integrating technology into classroom curriculum does not necessarily lead to the desired results. Since all thought processes occur inside the teachers' heads, they cannot be verified. However, how a teacher comprehends and then presents his/her knowledge to the class may be one of the most important variables in the implementation of ICT in the educational environment.

Borko and Putnam (1995) suggested that where knowledge directly influences a teacher's thinking, it predicts their actions in a classroom. To understand teaching, one must then examine the teacher's knowledge system, which includes the teacher's thoughts, judgements and decisions, associations between their knowledge systems and cognitions and how these lead to action. A famous quote attributed to Albert Einstein said, "Not everything that can be counted counts, and not everything that counts can be counted." To facilitate the improvement of teacher's practice, Borko and Putnam suggested that we assist them to expand their knowledge systems (p.37).

Training

Training teachers in the use (and eventual implementation) of ICT is vital for integrating ICT in the classroom. This area has come under scrutiny by the research community since there is an obvious relationship between training teachers in ICT and its subsequent implementation. The rational approach that most of the schools have taken since the introduction of ICT in schools is to train teachers in the use of ICT so that they can implement ICT in their respective teaching. This (expected) simple transition does not always translate from learning to teaching in a number of cases. The reasons are complex and multifaceted - from continuously upgrading hardware and software, to student computer ratios, to prior knowledge, to amounts of training and many more areas that are being highlighted as research in this area continues.

The type of training given is also noteworthy since according to Phelps, Hase and Ellis (2005), "many ICT programs are directive, training through a series of step-by-step instructions and concentrating on a particular program or computer utility" (p.68). The key issue here according to their research, is that computer technology is developing at a fast speed. For those individuals undertaking traditional learning in the use of a software program, the knowledge will become out-dated rather quickly (p.68).

Browne and Ritchie (1991) found that a noteworthy constraint of in-service teacher training is that it becomes a medium for "simply providing knowledge to teachers and doing little to help transfer the skills to actual classroom implementation" (p.28). Such transfer needs to be explicitly modeled – since it cannot be assumed that teachers will automatically generate these ideas on their own. A significant number of teachers in training as well as in-service teachers accept the fact that they are not trained adequately and are frequently not given appropriate tools to implement ICT in their practice (Hardy, 2003). This finding corroborates that of the US National Teacher Survey (2005) when only one quarter of the teachers perceived that their training was adequate enough to support their use of current instructional software.

The issue spreads itself beyond the perimeter of adequate training. For example, Bosley and Moon (2003) found inconsistencies between the extent of ICT training received by a teacher and the degree to which the teacher applied that training in their practice. The authors believed, that this finding suggested a lack of confidence in relating the learning (from the training) into a successful implementation in the classroom. According to Brown and Ritchie (1991), the teacher must present the information in a cognitive form and also demonstrate

confidence and autonomy in the application of the material with students during classroom utilization of technology skills (p.30).

Another dimension to consider is that training a person on the usage of a system does not directly translate to a full blown application of the product, since teachers are not usually given any specific training in the area of multiple users on single-user computer systems. In this area as well as others highlighted in current research, it has become crucial that teachers need to be specifically trained - not just in understanding how the technology works but also the applicability of the technology in order to successfully integrate ICT in their teaching (Markauskaite, 2007; Mitchem, Wells, & Wells, 2003; Yildirim, 2000). During their research Kafyulilo, Fisser and Voogt (2015) found that attending directly relevant ICT professional training courses positively impacted the teachers' confidence when engaging with technology.

Phelps, Hase and Ellis (2005) suggested that end-user computer education programs require modifications in attitudes, values and beliefs to allow change and provide the confidence for ongoing learning. They noted that program participants need application skills more than training because any directed learning software they learn in a training program will be outdated soon with its successor (p.68). Hence, Castro Sánchez and Alemán (2011) suggested that teachers engage with ICT integration in classroom with flexibility and receptiveness.

DISCUSSION

Summarising the literature by various experts in the field, a number of hindrances were identified. However, when looked at closely, the principal factor that was frequently emphasized was (lack of) knowledge/skill. This factor impacted most on the other factors that were identified as hindrances: lack of knowledge and skills caused some teachers to - fear loss of control (Hodas, 1993), lack of confidence in utilizing ICT tools (Tella et al. 2007), inability to translate training into their teaching practice and curriculum design (Bauer, 2000; Hardy, 2003), inability to connect pre-service training to classroom application owing to variations in learning the material and teaching it (Oren, Mioduser, and Nachmias, 2002). Addressing a part of this issue is the work of Nikolopoulou & Gialamas (2016) and Kafyulilo et.al. (2015) that suggested attending directly relevant ICT professional training courses. These courses positively impacted the teachers' confidence when engaging with technology.

The other key factor highlighted was equipment. Nikolopoulou & Gialamas (2016) echoed the research by Awan (2012) and noted that factors such as access to equipment, training, and the support of the education community, played a huge part in the attitude the teacher had and their inclination to integrate the ICT in their practice. Keeping these concerns in mind when it comes to developing learning environments, it was realized that the focus needed to be shifted from developing technology intensive classrooms. For instance, although there are potential benefits of using the latest ICT in teaching and learning, one should bear in mind that the value of knowledge that can be imparted and gained on its own with limited use of technology is valuable. Hence, Castro Sánchez and Alemán (2011) suggested that teachers engage with ICT integration in classroom with flexibility and receptiveness. This open-minded approach would allow teachers to acquire new pedagogical strategies and easily familiarise themselves with the technology leading them to integrate it with comfort. The President's Panel on Educational Technology (1997) echoed a similar sentiment by suggesting that lessons using ICT should not focus on just the capability of the hardware; they should highlight the content and pedagogy (p.8). The focus then in the implementation of ICT shifts from the state and capability of the technology to what advances in comprehension can be achieved by the students during learning with technology.

A key issue to raise is that if group instruction and group learning using ICT is the current reality, then why not embrace it and modify current teaching and learning practices accordingly? Shared use of computers has been the reality since microcomputers were introduced into classrooms. Hence, to support optimal learning using ICT, if we use a carefully planned approach instead of simply placing students together in groups, we should be able to achieve a successful learning environment that could potentially be richer than an individualized learning environment.

ACKNOWLEDGEMENT

The author wishes to thank Dr. Anne MacCleave and the George Cheong and Sons Memorial Endowed Scholarship Fund

REFERENCES

Agyei, D. D., & Voogt, J. (2014). Examining factors affecting beginning teachers' transfer of learning of ICT-enhanced learning activities in their teaching practice. *Australasian Journal of Educational Technology*, *30*(1).

Algemeen Directeurenoverleg Educatieve Faculteiten (ADEF) - General Consultative Body of Head Teachers on Educational Faculties (2009, May). *ICT Knowledge Base*. Retrieved from : http://edusummit.nl/attachments/session=cloud_mmbase +2001141/ICT_Knowledge_Base.pdf

Ali, A. (2007, November 1). Costs prevent schools from providing students laptops. *Medill Reports Washington*. Retrieved from http://news.medill.northwestern.edu/ washington.

Aronson, R.B. (2008, December). Trash, refit, or buy new? : Is your machine tool too dumb to upgrade? *Manufacturing Engineering, 141*(6), 77-84.

Awan, R.N. (2012). A study of teachers' opinions and experiences on the use of computers and laptops in classrooms in the United Arab Emirates. *2012 International Conference on Management and Education Innovation. IPEDR, 37*, 257-268.

Barak, M. (2006). Instructional principles for fostering learning with ICT: teachers' perspectives as learners and instructors. *Education Information Technology, 11*,121-135.

Bauer, J. F. (2000, November). A technology gender divide: Perceived skill and frustration levels among female pre-service teachers. Paper presented at the *Annual Meeting of the Mid-South Educational Research Association*, Bowling Green, KY. (Eric Document Reproduction Service No. ED 447137).

Bennett, P.W. (2011, February 27). The high cost of school computing: Why is IT so sacrosanct? *Educhatter's Blog*. Retrieved from : http://educhatter.wordpress.com/2011/02/27/the-high-cost-of-school-computing-why-is-it-so-sacrosanct/

BESA (2002). *ICT in UK State Schools 2002: A summary report*. Retrieved from http://www.besanet.org. uk/ict2002/summary.htm.

Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3), 235-245.

Borko, H., & Putnam, R. T. (1995). Expanding a teacher's knowledge base: A cognitive psychological perspective on professional development. In T. R. Guskey & M. Huberman (Eds.), *Professional development in education: New paradigms & practices* (pp. 35-66). NY: Teachers College Press.

Bosley, C., & Moon, S. (2003). Review of existing literature on the use of information and communication technology within an educational context. Derby: Centre for Guidance Studies, University of Derby.

British Educational Communications and Technology Agency (Becta) (2004). *A review of the research literature on barriers to the uptake of ICT by teachers.* Retrieved from http://www.becta.org.uk

Browne, D.L., & Ritchie, D.C. (1991). Cognitive apprenticeship: A model of staff development for implementing technology in schools. *Contemporary Education, 63*(1), 28-33.

Castro Sánchez, J.J., & Alemán, E.C. (2011). Teachers' opinion survey on the use of ICT tools to support attendance-based teaching. *Journal Computers and Education, 56*, 911-915.

Chai, C.S., Hong, H.Y., & Teo, T. (2009). Singaporean and Taiwanese pre-service teachers' beliefs and their attitude towards ICT: A comparative study. *The Asia-Pacific Education Researcher, 18*, 117–128.

Cook, D.A., & West, C.P. (2012) Conducting systematic reviews in medical education: A stepwise approach. *Medical Education, 46*, 943–952.

Corbett, B.A., & Wilms, J.D. (2002). Canadian students' access to and use of information and communications technology. *2002 Pan-Canadian Education Research Agenda Symposium*. Montreal.

Culp, K., Honey, M., & Mandinach, E. (2005). A retrospective on twenty years of education technology policy. *Journal of Educational Computing Research, 32*(3), 279-307.

Dawes, L. (2001) What stops teachers using new technology? In M. Leask (Ed.), *Issues in Teaching using ICT* (pp.61-79). London: Routledge.

Dhanarajan, G. (2002). Objectives and strategies for effective use of ICTS. In W. D. Haddad & A. Draxler (Eds.), *Technologies for education potential, parameters and prospects* (pp.58-74). UNESCO and Academy for Educational Development.

DiSessa, A.A. (2000). *Changing minds: computers, learning and literacy*. MIT Press.

Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education, 51*(1), 187-199.

Eggen, P., & Kauchak, D. (2003). *Educational psychology: Windows on classrooms* (6th ed.). Columbus, Ohio: Prentice Hall.

Ertl, H., & Plante, J. (2004). *Connectivity and learning in Canada's schools*. Statistics Canada Science, Innovation and Electronic Information Division. Catalogue No. 56F0004MIE - No. 011.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47-61.

Ertmer, P.A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration. *Educational Technology Research and Development (ETRandD), 53*(4):25-39.

Fabry, D. L., & Higgs, J. R. (1997). Barriers to the effective use of technology in education: Current status. *Journal of Educational Computing Research, 17*(4), 385–395.

Fullan, M. (2007). *The new meaning of educational change* (4th Ed.). New York, NY: Teachers College Press.
Goktas, Y., Gedik, N., & Baydas, O. (2013). Enablers and barriers to the use of ICT in primary schools in Turkey: A comparative study of 2005-2011. *Computers & Education, 68*, 211–222.
Hadjerrouit, S. (2009). Didactics of ICT in secondary education: Conceptual issues and practical perspectives. *Issues in Informing Science and Information Technology. 6*, 153–178.
Hammond, M. (2014). Introducing ICT in schools in England: Rationale and consequences. *British Journal of Educational Technology, 45*(2), 191-201.
Hardy, M. D. (2003). "It should have been stressed in all education classes": Preparing pre-service teachers to teach with technology. Report: Searcy, AR. (Eric Document Reproduction Service No. ED 478379).
Hindle, T. (2008). *Guide to management ideas and gurus*. London: Profile Books.
Hodas, S. (1993). Technology refusal and the organizational culture of schools. *Education Policy Analysis Archives, 1*(10). Retrieved from http://epaa.asu.edu/epaa/v1n10.html
Hu, W. (2007, May 4). Seeing no progress, some schools drop laptops. *The New York Times.* Retrieved from http://www.nytimes.com.
Huang, H. M., & Liaw, S. S. (2005). Exploring user's attitudes and intentions toward the web as a survey tool. *Computers in Human Behavior, 21*(5), 729-743.
International Confederation of Principals (2003, June). The role of ICT in learning: implications for the ICP and its members. ICP Position Paper 3. Approved at Ottawa Council Meeting: February 2003. Retrieved from : http://www.icponline.org/index.php?option=com_content&view=article&id=86%3Athe-role-of-ict-in-learning&catid=27%3Aeducation&Itemid=47
Jimoyiannis, A., & Komis, V. (2007). Examining teachers' beliefs about ICT in education: Implications of a teacher preparation programme. *Teacher Development, 11*(2), 149-173.
Johnson, L., Smith, R., Willis, H., Levine, A., & Haywood, K. (2011). *The 2011 Horizon Report*. Austin, Texas: The New Media Consortium. Retrieved from: http://net.educause.edu/ir/library/pdf/HR2011.pdf
Kafyulilo, A., Fisser, P., & Voogt, J. (2015). Factors affecting teachers' continuation of technology use in teaching. *Education and Information Technologies*. doi:10.1007/s10639-015-9398-0.
Korte, W. B., & Hüsing, T. (2007). Benchmarking access and use of ICT in European schools 2006: Results from head teacher and a classroom teacher surveys in 27 European countries. *eLearning Papers, 2*(1). Retrieved from http://www.elearningeuropa.info/files/media/media11563.pdf.
Kulik, J. A., Kulik, C. C., & Bangert-Drowns, R. L. (1985). Effectiveness of computer-based education in elementary schools. *Computers in Human Behavior 1*(1), 59-74.
Larkin, K. (2011). You use! I use! We use!: Questioning the orthodoxy of one-to-one computing in primary schools. *Journal of Research on Technology in Education, 44*(2), 101-120.
Lei, J. (2010). Quantity versus quality: A new approach to examine the relationship between technology use and student outcomes. *British Journal of Educational Technology, 41*(3), 455-472.
Magliaro, J., & Ezeife, A.N. (2007). Pre-service teachers' preparedness to integrate computer technology into the curriculum. *Canadian Journal of Learning and Technology, 33*(3), 95-111.
Markauskaite, L. (2007). Exploring the structure of trainee teachers' ICT literacy: The main components of, and relationships between, general cognitive and technical capabilities. *Education Technology Research Development, 55*, 547-572.
McGehee, J., & Griffith, L.K. (2004). Technology enhances student learning across the curriculum. *Mathematics Teaching in the Middle School, 9*(6), 344-349.
Mitchem, K., Wells, D., & Wells, J. (2003). Effective integration of Instructional Technologies (IT): Evaluating professional development and instructional change. *Journal of Technology and Teacher Education, 11*(3), 397-414.
Montgomerie, C., & Irvine, V. (2001). Computer skill requirements for new and existing teachers: Implications for policy and practice. *Journal of Teaching & Learning, 1*(1), 43-55.
Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education, 9* (3), 319-341.
National Teacher Survey. (2005). Teachers talk tech series white paper. Commissioned by CDW-G. Retrieved from: http://newsroom.cdwg.com/features/2005Natl-TeacherSurvey.pdf
Nikolopoulou, K., & Gialamas, V. (2016). Barriers to ICT use in high schools: Greek teachers' perceptions. *Journal of Computers in Education, 3*(1), 59-75.
Norris, C., Sullivan, T., & Poirot, J. (2003). No access, no use, no impact: Snapshot surveys of educational technology in K-12. *Journal of Research on Technology in Education, 36* (1), 15-27.
Nova Scotia Department of Education, Learning Resources and Technology (2005). *Information and communication technology in public schools*. Retrieved from http://lrt.ednet.ns.ca/pdf/it_research.pdf
O'Mahony, C. (2003). Getting the information and communications technology formula right: access + ability=confident use. *Technology, Pedagogy and Education, 12*(2).
Oblinger, D. G., & Oblinger, J.L. (Eds.) (2005). *Educating the Net Generation*. Washington, D.C.: EDUCAUSE.

OECD (2001). *Learning to change: ICT in schools*. Centre for Educational Research and Innovation. Retrieved from http://oecdpublications.gfi-nb.com/cgi-bin/ OECDBookShop.storefront/EN/product /962001131P1.

Oren, A., Mioduser, D., & Nachmias, R. (2002). The development of social climate in virtual learning discussion groups. *International Review of Research in Open and Distance Learning, 3*(1), 1-19.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers and Education, 37*, 163–178.

Pelgrum, W. & Law, N. (2003). *ICT in education around the world: trends, problems and prospects.* Paris: UNESCO International Institute for Educational Planning.

Phelps, R., Hase, S., & Ellis, A. (2005). Competency, capability, complexity and computers: Exploring a new model for conceptualising end-user computer education. British Journal of Educational Technology, *36*(1), (pp. 67–84).

Plante, J., & Beattie, D. (2004, June). *Connectivity and ICT integration in Canadian elementary and secondary schools: First results from the information and communication technologies in school survey, 2003-2004.* Ottawa, Canada: Statistics Canada.

President's Panel on Educational Technology (1997). *Report to the President on the use of technology to strengthen K-12 education in the United States.* Washington D.C.: U.S. Government Printing Office.

Preston, C., Cox, M. J., & Cox, K. M. J. (2000). *Teachers as innovators: An evaluation of the motivation of teachers to use information and communications technologies.* Croydon: Teacher Training Agency/Mirandanet.

Sandborn, P. (2007). Software obsolescence – Complicating the part and technology obsolescence management problem. *IEEE Trans on Components and Packaging Technologies, 30*(4), 886-888.

Sime, D., & Priestley, M. (2005). Student teachers' first reflections on information and communications technology and classroom learning: Implications for initial teacher education. *Journal of Computer Assisted Learning 21*, 130–142

Slaouti, D., & Barton, A. (2007). Opportunities for practice and development: Newly qualified teachers and the use of information and communication technologies in teaching foreign languages in English secondary school contexts. *Journal of In-service Education, 33*(4), 19.

Surowiecki, J. (2004). *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*. New York: Doubleday.

Statistics Canada. (2004). *Connectivity and ICT integration in Canadian elementary and secondary schools: First results from the Information and Communications Technologies in Schools Survey, 2003-2004*, Education, skills and learning – Research papers, Catalogue No. 81-595-MIE, no. 17, June. Retrieved from http://dissemination.statcan.ca:8083/english/research/81-595-MIE/81-595-MIE2004017.pdf

Tao, P-K., & Gunstone, R. F. (1999). Conceptual change in science through collaborative learning at the computer. *International Journal of Science Education, 21*, 39-57.

Tapscott, D. (1998). *Growing up digital: The rise of the Net generation*. New York: McGraw-Hill.

Tella, A., Tella, A., Toyobo, O. M., Adika, L. O., & Adeyinka, A. A. (2007). An assessment of secondary school teachers' uses of ICTs: Implications for further development of ICT's use in Nigerian secondary schools. *The Turkish Online Journal of Educational Technology, 6*(3), 12.

Teo, T. (2008). 'Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology, 24*(4), 413-424.

UNESCO (2004). *Integrating ICTs into education: Lessons learned*. Bangkok: UNESCO.

U.S. Department of Education (2000). *E-learning: putting a world-class education at the fingertips of all children.* Washington, DC.

Wastiau, P., Blamire, R., Kearney, C., Quittre, V., Van de Gaer, E., & Monseur, C. (2013). The use of ICT in education: a survey of schools in Europe. *European Journal of Education, 48*(1), 11–27.

Watson, D. M. (1998). Blame the technocentric artifact! What research tells us about problems inhibiting teacher use of IT. In G. Marshall, & M. Ruohonen (Eds.), *Capacity building for IT in education in developing countries* (pp.185–192). London: Chapman & Hall.

Webb, M. (2002). Pedagogical reasoning: Issues and solutions for the teaching and learning of ICT in secondary schools. *Education and Information Technologies, 7*(3), 237-255.

Woodrow, J. E. (1992). The influence of programming training on the computer literacy and attitudes of pre-service teachers. *Journal of Research on Computing in Education, 25*(2), 200–219.

Yildirim, S. (2000). Effects of an educational computing course on pre-service and in-service teachers: A discussion and analysis of attitudes and use. *Journal of Research on Computing in Education, 32*(4), 479-495.

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. (2002). Conditions for classroom technology innovations. *Teachers College Record, 104*(3), 482- 515.

Online Interaction Quality among Adult Learners: The Role of Sense of Belonging and Perceived Learning Benefits

NGUYET A. DIEP
Department of Educational Sciences, Vrije Universiteit Brussel, Brussels, Belgium, Pleinlaan 2, 1050 Elsene, Brussels, Belgium
Diep.Anh.Nguyet@Vub.Be

CELINE COCQUYT
Department of Educational Sciences, Vrije Universiteit Brussel, Brussels, Belgium, Pleinlaan 2, 1050 Elsene, Brussels, Belgium
Celine.Cocquyt@Vub.Ac.Be

Chang Zhu3
Department of Educational Sciences, Vrije Universiteit Brussel, Brussels, Belgium, Pleinlaan 2, 1050 Elsene, Brussels, Belgium
Chanzhu@Vub.Ac.Be

TOM VANWING
Department Of Educational Sciences, Vrije Universiteit Brussel, Brussels, Belgium, Pleinlaan 2, 1050 Elsene, Brussels, Belgium
Tvwing@Vub.Ac.Be

ABSTRACT
The present study employs social cognitive theory (SCT) and social capital as the guiding frameworks to explain online interaction quality among learners in a blended learning program (*N*=179). Capturing performance expectancy by perceived learning benefits and online interaction quality with nuanced cognitive measures, the study aims to validate how the SCT and social capital, which are mostly used in predicting online interaction quality in virtual settings, are applicable in an academic setting. More specifically, we investigate the relationship between trust, norms of reciprocity, sense of belonging, altruism, perceived learning benefits and learners' perception of online interaction quality. Data were collected quantitatively by means of a questionnaire. Confirmatory factor analysis (CFA) and path analysis were employed to validate the instrument and answer the research question respectively. The findings show that only sense of belonging and perceived learning benefits significantly account for a moderate variance in online interaction quality (R^2 = .46). Based on the findings, implications for instructional practice and further research are suggested.

Keywords: online interaction quality, social capital, perceived learning benefits, and adult learners

INTRODUCTION
Different instructional approaches such as scaffolding, prompting, and role assignments have been adopted by instructors in online and blended learning to enhance learners' participation in online discussions. Of equal importance, the quality of these online discussions is also a major concern. If high level of online participation is hard to achieve, high quality of online interaction is even more difficult to reach. There are different factors inhibiting adult learners from being active online, e.g. assuming different roles during the undertaking of the study or the preference of interacting with those of similar backgrounds (Yukselturk, 2010). Nevertheless, the decision to dedicate time and effort to online discussion of adults are normally weighted based on cost-benefits evaluation (Kollock, 1999). This means of learners are intrinsically and extrinsically motivated in their online participation, factors related to situational variables will be of less significance.

The quality of online interaction has been investigated in a number of settings. For example, Peltier, Schibrowsky, and Drago's study (2007) confirms that instructor's facilitation has a positive impact on learners' perception of online interaction quality. Additionally, Lee and Bonk (2016) found that the higher the degree of closeness learners perceived, the more they became involved in their online participation in blogs, thus contributing more to the community of learners. In virtual learning communities in which the sharing of knowledge is voluntary, Chang and Chuang (2011) and Chiu, Hsu, and Wang (2006) found that social capital, measured by trust, norms of reciprocity, and sense of belonging significant predict the quality of knowledge sharing. The nature of virtual learning communities and the learning communities of adult learners share the essence that their members are more likely to contribute and advance the quality of online interactions when they are motivated and intrigued by factors other than obligation from the course requirement. Thus employing the social capital framework along with factors related to learners such as performance expectancy as an extrinsic motivational factor and altruism as an intrinsic motivational factor would provide more insights regarding

enablers of online interaction quality. However, research findings up to date have revealed that such studies in formal education settings are still scarce. The results from studies in virtual learning communities as those carried out by Chang and Chuang (2011), Chiu et al. (2006) and Lampel and Bhalla (2007) cannot be generalized to adult education settings for a number of reasons. The first is that the quality of online interaction or knowledge sharing in these studies is that of being accurate, reliable, complete and understandable (Chiu et al., 2006). Thus when applied to educational setting, such measures of the quality of online interaction cannot comprehensively capture the cognitive essence required for academic knowledge development. Second, performance expectancy in virtual learning communities is conceptualized as reputation and community building (Chang & Chuang, 2011; Chiu et al., 2006). These outcome expectations are not applicable in formal education settings as adult learners may not have that motivation of enhancing individual status and expanding social connections with peers given that they have other options in addition to online interaction opportunities.

Against these backgrounds, the present study aims to bridge the gap in literature by investigating how social capital and factors related to learners' motivation such as altruism and performance expectancy measured by perceived learning benefits are associated with online interaction quality. Conducted in the context of formal education setting that employs blended learning as mode of instructions, the present study aims to unravel critical factors contributing to the quality of online interaction among a group of adult learners who are heterogeneous in their socio-demographic background. More specifically the following research question is addressed: What are the relationships between social capital and learners' personal-related factors, namely, altruism and perceived learning benefits and online interaction quality? In addition, we also examine if these relationships are moderated by learners' socio-demographics, including age, gender, educational attainment, and employment status.

THEORETICAL BACKGROUND

The quality of online discussion or knowledge sharing by members in a learning community is affected by various factors. Hsu, Lu, Yen and Chang (2007) argue that the extent to which individuals contribute to the learning community is contingent on their personal motivation and the social environment, of which they are a member. Researchers have based largely on the Socio Cognitive Theory (Bandura, 1989) to explain the behaviors of knowledge sharing in an online learning community, e.g. Chiu et al. (2006). The Social Cognitive Theory states that a person's behavior is influenced by the social networks and their cognition, e.g. expectations including outcome expectations and self-efficacy (Bandura, 1989). Previous studies have included social capital as aspects of the social networks and performance expectancy and altruism as those of personal cognition in explaining the quality of online interaction among learners (e.g. Tamjidyamcholo, Baba, Tamjid & Gholipour, 2013). Self-efficacy, being one of the factor in the SCT, is not included in most studies, e.g. Hsu et al. (2006) for the reason that self-efficacy is context-specific and hence is subject to change over time (Chen, Gully, & Eden, 2001). Thus in the following section, factors related to the social environment, namely social capital and personal cognition including performance expectancy and altruism that are hypothesized to be associated with online interaction quality are discussed.

Online interaction quality

Due to the fact that the context in previous studies is different from academic settings, the online interaction quality is measured by the quality of information shared rather the cognitive aspects related to knowledge construction such as triggering self-reflection and knowledge transfer. Taking this into account, the present study adopts the cognitive presence scale from Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, and Swan (2008) to capture the online interaction quality among the adult learners in a blended learning program. We define online interaction quality as an evaluation of how the learners perceive the interaction with other learners help them to build up their knowledge related to the courses and facilitate knowledge transfer.

Social capital

According to Putnam (2000), social capital refers to the networks, norms, and social trust that foster the collective processes and actions of members within a community for the public good. From a different standpoint, Bourdieu (1986) and Coleman (1988) (cited in Zhang & Kaufman, 2015) address social capital as the social networks and resources obtained by individuals through their memberships and interactions within the community. Bourdieu and Coleman's conceptualization of social capital implies that individuals can benefit from the community of their membership whereas Putnam proposes that the community can benefit from the social capital generated through the interactions among its members (Oztok, Zingaro, Makos, Brett, & Hewitt, 2015; Zhang & Kaufman, 2015). Despite different emphasis, these authors share the idea that social capital results from the dynamic interaction among members and an increase in social capital is beneficial for individuals and the community (Oztok et al., 2015).

When investigating the role that social capital plays in enhancing the quality of online interaction among learners, we view the concept from Putnam's perspective. This means that the trust, sense of belonging, and norms of reciprocity among the classmates are hypothesized to motivate them to actively contribute to the online discussions for leveraging the quality of one another's learning. In this study, we adopt the definition of trust, norms of reciprocity, and sense of belonging from Chang and Chuang (2011) to conceptualize and operationalize social capital. Accordingly, trust is defined as "individual beliefs and expectations that other participants can perform consistent behaviors to follow norms and principles of a virtual community" (Chang & Chuang, p.12). The authors refer to norms of reciprocity as the perception of fairness to mutually share knowledge to each other in a virtual community and sense of belonging as feeling of belonging to a group or a set of people. These three constituents of social capital have been confirmed as significant factors relative to online interaction quality in virtual communities in Chang and Chuang (2011), Chiu et al. (2006), and Tamjidyamcholo et al. (2013).

Altruism and performance expectancy

Altruism is defined as the offer to help others by voluntarily sharing knowledge without an expectation of a return from the recipients (Kollock, 1999; Steward & Gossain, 2006; Yu & Chu, 2007). According to Hung, Durcikova, Lai, and Lin (2011), altruism is considered a type of intrinsic motivation that triggers one's knowledge sharing to the community. However the authors found a non-significant effect of altruism on the quality of knowledge shared, which is in line with the findings from Lampel and Bhalla (2007) and contradictory to the results from Chang and Chuang (2011). In this regard, it is relevant to take Kollock's (1999) opinion into account, who postulates that altruism may compete with extrinsic motivation such as the evaluation of the gain that can be obtained. In fact, Hsu et al. (2006) and Hung et al. (2011) found that extrinsic motivation such as reputation is stronger than altruism in predicting the quality of online interaction in a community. In an educational setting, research validating the role of altruism as a measure of intrinsic motivation and performance expectancy as extrinsic motivation concerning online interaction quality is not yet recognized. In addition, performance expectancy in existent studies mainly focuses on reputation, community development, and network expansion. These outcomes are not highly relevant in educational settings because the most important motivation and goals of one's participation in online discussions related to the courses under question is the perception of how the community can help them to build and expand their knowledge repertoire. Therefore, this study addresses these two gaps by using perceived learning benefits of a measure of performance expectancy. The construct is adopted from Xie and Ke (2011) to capture the perceptions of learners as to how the learners evaluate the value of online discussion relative to their learning.

Based on these theoretical backgrounds, we hypothesize that social capital measured by trust, norms of reciprocity, and sense of belonging and learners' intrinsic and extrinsic motivation measured by altruism and perceived learning benefits respectively, will have a positive relationships with the quality of online interaction as perceived by the learners.

METHODOLOGY

Research design

The present study employed a quantitative approach to data collection by means of a questionnaire. Data were collected one time in different centers for adult education in Flanders (Belgium). Thus in terms of design, the study is cross-sectional in nature. The questionnaire was distributed both online on the researchers' institutional platform or in the participants' classrooms with the presence of their instructors and one of the research members. To minimize issues related to common method bias, the participants were encouraged to give answers most relevant to them and therefore, no right or wrong answers were the case. The participation in the study was totally voluntary, i.e. no incentives were given and the anonymity of the participants was guaranteed.

Participants

The participants in this study are learners who were following the Specific Teacher Training program. The program employed blended learning as an instructional strategy. Learners who have successfully completed the program are granted with a certification to be qualified for teaching at secondary levels. After screening for incomplete and unengaged answers, one hundred and seventy nine questionnaires were retained for analyses. The number of female learners (61.5%) is nearly twice as much as male learners (38.5%). Higher secondary degree holders (57.5), constitute the majority, followed by higher education degree holders (39.1%) and lower secondary degree holders (3.4%). As for employment, learners who have a fulltime job is the biggest group (62.6%). Those who are part-timers accounts for 20.7% and those who are full-time enrolled 10.6%. Learners aged between 18-30 accounts for half of the sample, followed by those aged between 31-40 (32.4%) and 41-50 (17.3%). The average age of the participants is M=32.08, SD=7.82.

Instrument

The present study used existing scales validated from previous studies. As for the independent variables, social capital including three dimensions, i.e. trust, norms of reciprocity, and sense of belonging, and altruism were adopted from Chang and Chuang (2011) and Chiu et al. (2006). Perceived learning benefits measuring how the learners perceived that online interactions with peers contribute to their understanding of the course were adapted from Xie and Ke (2011). Regarding the dependent variable quality of knowledge sharing, we have opted to modify the cognitive presence scale from Arbaugh et al. (2008) because the scale is more nuanced and applicable for capturing the cognitive quality of online interaction among a community of adult learners rather than a professional learning community as in Chang and Chuang (2011) and Chiu et al. (2006). In total, there are 32 items included in the questionnaire. After the scales have been decided upon, face validity had been verified by three experts in the fields of adult learning and social capital before they were translated into Dutch, which is the mother tongue of the participants. When there were discrepancies in the translation, a third Dutch-native colleague was consulted to ensure the clarity of the items' meaning into without losing the essence of the items in English.

Data analysis method

To answer the research questions, we applied Partial Least Square-Structural Equation Modeling (PLS-SEM) as method of data analysis. Accordingly, the analyses consisted of two phases. First the measurement model was validated by confirmatory factor analysis (CFA). At this step, construct validity was evaluated by two rules of thumbs suggested by Fornell and Larcker (1981) and Chin (1998) such that the average variance extracted (AVE) for each construct should be equal or greater than .50 and the square root of the AVE of each construct should be greater than the correlations of this specific with others. The second step in PLS-SEM was to confirm the hypotheses by means of path analyses. All these two steps were conducted by employing SmartPLS 2.0 M3 (Ringle, Wende, & Will (2005).

RESULTS

Measurement Validation

Confirmatory factor analysis shows that all items have adequate factor loadings (>.400) onto to their respective constructs. Thus no items have been removed. Table 1 presents the mean, standard deviations, the *AVEs*, composite reliability, and Cronbach's alpha.

Table 1: The mean, standard deviations, average variance extracted (*AVEs*), composite reliability, and Cronbach's alpha of the constructs

Constructs	*M* (*SD*)	*AVEs*	Composite reliability	Cronbach's Alpha
Trust	3.61 (0.56)	.57	.87	.82
Norms of reciprocity	3.78 (0.76)	.85	.92	.82
Sense of belonging	3.51 (0.72)	.76	.93	.90
Altruism	4.17 (0.63)	.84	.94	.90
Perceived learning benefits	3.33 (0.70)	.67	.91	.88
Online interaction quality	2.92 (0.91)	.68	.96	.96

As for divergent validity, the square root of *AVE* of each construct displays greater value than the correlations between the constructs themselves. This reveals that multi-collinearity is not a concern in this sample. Table 2 presents the *AVEs* and the correlations among the constructs.

Table 2: The correlations among the constructs with their respective *AVEs* (in bold)

Constructs	OIQ	AL	PLB	NP	SB	T
OIQ	**.82**					
AL	0.114	**.92**				
PLB	0.619	0.235	**.82**			
NP	0.293	0.554	0.275	**.92**		
SB	0.417	0.469	0.362	0.586	**.87**	
T	0.237	0.360	0.125	0.526	0.572	**.75**

Notes for abbreviations: Online interaction quality (OIQ), altruism (AL), perceived learning benefits (PLB), norms of reciprocity (NP), sense of belonging (SB), and trust (T).

The structural model

As the measurement model has been confirmed, path analyses were followed to identify the significant predictors of online interaction quality. According to the results presented in Table 3, perceived learning benefits were the most significant factor (β=.55, p<.001). However, altruism did not significantly predict online

interaction quality (β=-.18, p>.05), which means extrinsic motivation has outweighed intrinsic motivation. Among the three constructs of social capital, only sense of belonging was found as the significant factor (β=.23, p<.05). Altogether, the significant predictors account for a variance of 46% in online interaction quality, which shows a medium effect according to Hair, Ringle, & Sarstedt (2011).

Table 3: Result from path analysis for the outcome variable online interaction quality (R^2 = .46)

Independent Constructs	Standardized coefficients	*t*-statistics
Trust	.08	.86
Norms of reciprocity	.07	.64
Sense of belonging	.23	1.97*
Altruism	-.18	1.79
Perceived learning benefits	.55	7.22***

Notes: *p<.05, **p<.001

Analyses of variance

Analyses of variance, including ANOVAs and *t*-tests were used to examine if socio-demographic variables may affect the relationship among the variables.

(1) T-test result showed that there was no significant difference between male and female learners regarding perception of online interaction quality, $t(177) = 0.277$, $p = .785$.

(2) The results from ANOVA reveal that there was no statistical differences among the three age groups of learners as for perception of online interaction quality, $F(2) = 0.067$, $p = .935$. However, a significant difference was found among learners who have different educational attainment, $F(2)=4.692$, $p = .01$ and employment statuses, $F(2) = 3.362$, $p = .037$. Post-hoc analyses further revealed that learners who hold a higher education degree ($M = 2.67$, $SD = 0.04$) had significant lower mean scores than higher-secondary degree holders ($M= 3.09$, $SD = 0.84$). In addition, learners who were a part-timer scored higher ($M = 3.16$, $SD = 0.85$) than learners who were fulltime enrolled ($M = 2.5$, $SD = 0.91$).

As educational attainment and employment status can moderate the relationships between the independent variables, namely altruism, perceived learning benefits, trust, norms of reciprocity, and sense of belonging and online interaction quality, we conducted multi-group moderation to validate the model. Following Keil, Saarinen, Tan, Tuunainen, Wassenaar, and Wei's (2000) approach, the model parameters or regression coefficients and standard errors (*SE*) of each path were estimated for each group. Subsequently, *t*-statistics were applied to find out if the effects of the five independent variables were significantly different as a function as group differences. However, all *t*-statistics were non-significant indicating that educational attainment and employment status were not significant as moderators. The results of multi-group moderation analyses are presented in Table 4.

Table 4: Results of multi-group moderation for educational attainment and employment status

Latent variables	Higher secondary degree holders (n=103)		Higher education degree holders (n=70)		*t*-statistics	*p*-values (*2-tailed*)
	Regression coefficients	*SE*	Regression coefficients	*SE*		
Altruism	-0.07	0.11	-0.28	0.12	1.27	0.21
Perceived learning benefits	0.51	0.08	0.61	0.07	0.88	0.38
Trust	-0.03	0.14	0.15	0.09	0.96	0.34
Norms of reciprocity	0.15	0.11	0.02	0.10	0.83	0.41
Sense of belonging	0.19	0.12	0.10	0.11	0.57	0.57
Latent variables	Part-time learners (n=37)		Fully-enrolled learners (n =19)		*t*-statistics	*p*-values (*2-tailed*)
	Regression coefficients	*SE*	Regression coefficients	*SE*		
Altruism	-0.25	0.13	-0.14	0.11	0.59	0.56
Perceived learning benefits	0.54	0.06	0.41	0.08	1.28	0.21
Trust	0.17	0.15	0.16	0.19	0.06	0.95
Norms of reciprocity	0.34	0.12	0.07	0.16	1.32	0.19
Sense of belonging	0.22	0.19	0.36	0.16	0.48	0.64

DISCUSSION AND CONCLUSION

Based on SCT (Bandura, 1989) and social capital theory (2000), the present study investigates the relationships between social capital, personal related factors, i.e. altruism and perceived learning benefits, and online interaction quality. The study has operationalized perceived learning benefits and online interaction quality in such a way that is more relevant to a community of adult learners following a formal education program. Multigroup moderation was also conducted to examine the moderating effects of socio-demographic factor. Yet, non-significant moderation was found.

Although outcome expectancy in this study was captured by perceived learning benefits to be more relevant in education settings, its positive relationship with online interaction quality is in line with previous studies (Chang & Chuang, 2011; Chiu et al, 2006). However, altruism as a measure of learners' intrinsic motivation failed to predict online interaction quality, which is also found in Hung et al. (2011) and Lampel and Bhalla (2007). This finding highlights that in virtual learning communities, intrinsic motivation manifest in altruism is more important to explain the quality of interaction because the sustainability of the communities highly depend on the voluntariness of each member. In educational settings, altruism may lack its prevalence because the need to sustain the online interactions among the learners may not be the responsibility of the learners but the instructors instead. Given this lack of need, the learners may rely on their evaluation of performance expectancy, namely perceived learning benefits as the sole motivation for their quality contribution. In addition, as most learners in this sample are employed fulltime and part-time, the evaluation of cost benefits has outweighed altruism. Thus to successfully enhance the quality of online interaction, it is suggested that the instructors can explicitly clarify how online interactions with peers are aligned with the learning objectives. In so doing, the learners will be more motivated to substantially contribute to online discussions and overcome barriers such as the lack of time due to other obligations.

Contradictory to most studies that employ the social capital framework to explain online interaction quality, only sense of belonging was positively correlated with the dependent variable. That trust and norms of reciprocity were found to be non-significant suggest that learners in a program may have known each other and consider that helping each other in need is a normal practice. Then there is not that high variability in terms of trust and norms of reciprocity among learners in a program whose identities are more visible than those in virtual learning communities as investigated by Hsu et al. (2007). Being found as a significant predictor, sense of belonging has demonstrated that it is the most significant element of social capital in online learning environment as initially postulated by Rovai (2002). Thus, an online learning environment in which learners feel that they share a common goal, e.g. enhancing knowledge on a particular topic or tackling an educational issue, and that they are highly welcomed to present their voices is desired to bring about high quality of online interaction. To achieve this goal, again the instructors' strategies in creating opportunities for the sharing of personal background and lived experiences among learners as suggested by Nistor, Daxecker, Stanciu, and Diekamp (2015) is recommended. Additionally, effort to build up common goals and missions related to the professional career such as an educator identity as in this study, should also be invested as this helps the learners feel more connected to one another and chances are that they will be more active in their online contributions.

There are some limitations that make the generalization to be taken with caution. First, although self-report questionnaires can be the most appropriate method to capture relative concepts such as trust, sense of belonging and perceived learning benefits, it is recognized that the quality of online interaction can be better measured by objective methods such as message coding. Therefore, future research with more objective measures of online interaction will help to further validate the findings. The translation of the questionnaire is also one factor that needs to be taken into account. More specifically, we suggest validating the questionnaire in an English-speaking sample to confirm the reliability and validity of the measurement model. Third, that the participants in this sample were adult learners following a common program, namely Specific Teacher Education, may limit the interpretations of the results in hard disciplines such as Computer Science. For example, Neumann, Parry, and Becher (2002) postulate that learners in different disciplines may have different epistemological beliefs and learning approaches with soft-disciplined faculty being more subscribed to reflective discussions as method of knowledge construction. Therefore, we suggest that a comparative study using disciplines as a moderator can be more helpful to gain more insights into the critical enablers of online interaction quality.

In conclusion, in an adult educational context, the present study has revealed that the SCT and social capital theories can be relevant to explain the quality of knowledge sharing among learners in a blended learning program. The two critical elements that have been identified are perceived learning benefits and sense of belonging, which help to explain a moderate variance in learners' perception of online interaction quality. Based on these findings, implications for instructional practices have also been proposed. In essence, making learning

goals explicit, underlying how online interaction is important to one's learning, and creating a mutually respectful environment with shared goals and identity are of significance to enhance the quality of online interaction among learners.

REFERENCES

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and higher education*, *11*(3), 133-136.

Bandura, A. (1989). Human agency in social cognitive theory. *American psychologist*, *44*(9), 1175.

Chang, K. C., Wong, J. H., Li, Y., Lin, Y. C., & Chen, H. G. (2011). External social capital and information systems development team flexibility. *Information and Software Technology*, *53*(6), 592-600.

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational research methods*, *4*(1), 62-83.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research*, *295*(2), 295-336.

Chiu, C. M., Hsu, M. H., & Wang, E. T. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision support systems*, *42*(3), 1872-1888.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research (JMR)*, *18*(1), 382-388.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, *19*(2), 139-152.

Hsu, M. H., Ju, T. L., Yen, C. H., & Chang, C. M. (2007). Knowledge sharing behavior in virtual communities: The relationship between trust, self-efficacy, and outcome expectations. *International journal of human-computer studies*, *65*(2), 153-169.

Hung, S. Y., Durcikova, A., Lai, H. M., & Lin, W. M. (2011). The influence of intrinsic and extrinsic motivation on individuals' knowledge sharing behavior. *International Journal of Human-Computer Studies*, *69*(6), 415-427.

Keil, M., Saarinen, T., Tan, B. C., Tuunainen, V., Wassenaar, A., & Wei, K. K. (2000). A cross-culturalstudy on escalation of commitment behavior in software projects. *Management Information Systems Quarterly*, 24(2), 299-325.

Kollock, P. (1999). The economies ol online cooperation. *Communities in cyberspace*, *220*.

Lampel, J., & Bhalla, A. (2007). The role of status seeking in online communities: Giving the gift of experience. *Journal of Computer-Mediated Communication*, *12*(2), 434-455.

Lee, J., & Bonk, C. J. (2016). Social network analysis of peer relationships and online interactions in a blended class using blogs. *The Internet and Higher Education*, *28*, 35-44.

Neumann, R., Parry, S., & Becher, T. (2002). Teaching and learning in their disciplinary contexts: A conceptual analysis. *Studies in higher education*, *27*(4), 405-417.

Nistor, N., Daxecker, I., Stanciu, D., & Diekamp, O. (2015). Sense of community in academic communities of practice: predictors and effects. *Higher Education*, *69*(2), 257-273.

Oztok, M., Zingaro, D., Makos, A., Brett, C., & Hewitt, J. (2015). Capitalizing on social presence: The relationship between social capital and social presence. *The Internet and Higher Education*, *26*, 19-24.

Peltier, J. W., Schibrowsky, J. A., & Drago, W. (2007). The interdependence of the factors influencing the perceived quality of the online learning experience: A causal model. *Journal of Marketing Education*, *29*(2), 140-153.

Putnam, R. D. (2000). Bowling alone: America's declining social capital. In *Culture and Politics* (pp. 223-234). Palgrave Macmillan US.

Ringle, C. M., Wende, S., & Will, S. (2005). *SmartPLS 2.0* (M3) Beta.

Rovai, A. P. (2002). Building sense of community at a distance. *The International Review of Research in Open and Distributed Learning*, *3*(1).

Stewart, K. J., & Gosain, S. (2006). The impact of ideology on effectiveness in open source software development teams. *Mis Quarterly*, 291-314.

Tamjidyamcholo, A., Baba, M. S. B., Tamjid, H., & Gholipour, R. (2013). Information security–Professional perceptions of knowledge-sharing intention under self-efficacy, trust, reciprocity, and shared-language. *Computers & Education*, *68*, 223-232.

Xie, K., & Ke, F. (2011). The role of students' motivation in peer-moderated asynchronous online discussions. *British Journal of Educational Technology*, *42*(6), 916-930.

Yu, C. P., & Chu, T. H. (2007). Exploring knowledge contribution from an OCB perspective. *Information & Management*, *44*(3), 321-331.

Yukselturk, E. (2010). An investigation of factors affecting student participation level in an online discussion forum. *TOJET: The Turkish Online Journal of Educational Technology*, *9*(2).
Zhang, F., & Kaufman, D. (2015). The impacts of social interactions in MMORPGs on older adults' social capital. *Computers in Human Behavior*, *51*, 495-503.

Screen Design Principles of Computer-Aided Instructional Software for Elementary School Students

Berrin Atiker
Department of Informatics, Istanbul Universty
atikerberrin@yahoo.com

Bülent Onur Turan
Department of Informatics, Mimar Sinan Fine Arts Universty
bulent.onur.turan@msgsu.edu.tr

ABSTRACT
This study aims to present primary school students' views about current educational software interfaces, and to propose principles for educational software screens. The study was carried out with a general screening model. Sample group of the study consisted of sixth grade students in Şehit Öğretmen Hasan Akan Elementary School. In this context, the evaluation of 142 sixth grade students' about existing software are analyzed with Instructional Software Screen Design Survey. Some of the survey items were created by researchers and some of them were taken from previously created questionnaire items. The research is limited with Bilden, Eurosoft, Kraker software and the sample group is limited to sixth grade students in Şehit Öğretmen Hasan Akan Elemantary School. In the scope of this study, selected examples of current instructional software are evaluated in terms of graphics, text, animation, color and screen layout. Survey data where students' ideas are collected is processed with the SPSS 15 software. There is significant difference in text, graphic and screen layout of three software. In addition, there is significant difference between Eurosoft and the other two software in terms of color and animation. In the light of the findings, revision of educational software will be useful. Qualified screen designs will be created with user reviews and the studies done in this field. Uncomplicated, simple structured graphics, and animations created with vibrant colors, and screenshots which can be adapted easily, won the admiration of students. The study based on findings aims at guiding software manufacturers and educators.

Keywords: Instructional softwares, Screen design, Elementary school education, Computer aided instruction, Computer Aided Learning.

INTRODUCTION
Developments in communication technologies form the basis of information society. Especially with the usage of computers and the Internet, it's easier to access desired information from all over the world. It's a fact that in contemporary wold, most things are carried out with computers. Children before the age of primary school are beginning to use various technological tools and equipments including computers.
Computer-aided instruction meets renewed needs of individuals, and provides learning environment for people from different geographical areas at any given time and place. In addition, computer-aided instruction provides a safe learning environment for students. Therefore, visual design and contents of a software are important in this area.

From the first examples of computer aided instruction, the text is seen as dominant, and interaction is limited with clicking "next" button or pressing the space key (Jones, 1995). With the increasing usage of computers in education, graphics, audio and video have taken their place in teaching software screens. In addition, users are able not only to control the video and audio just by clicking the forward key but also to manipulate the information on screen (Jones, 1995). However, text, graphics, animation, audio and other components of teaching software which display the information are far from having a purposeful organization to obtain information easily.

There are many samples of instructional software prepared for primary school students. But most of these software's screens are not prepared effectively. Software screens are far from being committed to the principles of design and learning theory.

In this study, screen design of instructional software is analyzed. The research is limited with Bilden, Eurosoft, and Kraker software, and the sample group is limited to sixth grade students in Şehit Öğretmen Hasan Akan Elemantary School. With survey data students' evaluations on this subject are investigated to redefine the screen design principles of instructional softwares.

LEARNING THEORIES AND COMPUTER AIDED INSTRUCTION

There are many theories explaining the learning process in humans. Among these, behavioral and cognitive learning theories guide the design of computer aided instruction.
According to Thorndike's law of effect in the field of learning, when the response to the stimulus encounters an award or a positive result, the relationship between stimulus and response gets stronger. According to Thorndike's other principle of law of exercise, strength of relationship between the stimulus and the response is proportional to the number of repetition.

According to Skinner, when human behavior receives positive responses, frequency of this behavior will increase (İşman, 2003). Reinforcements have an important role in the occurrence of a behaviors. Sense of accomplishment and satisfaction, and praise are examples of reinforcements, which are stimulants producing the desired results in learning environments.

Theories of behaviorism lay the theoretical foundations of computer aided instruction. The usage of reinforcements and other motivational tools in the educational software is the result of behavioral approaches. In addition, the common stages of educational software applications and exercises are a direct consequence of Thorndike's law of exercise.

Cognitive theories have emerged as a response to the behaviorism theory. These theories explain human learning and development in terms of changes in mental structures and intellectual processes involving the acquisition, organization and utilization of knowledge (Johnson, transferred from Schunk, 2014). Cognitive approaches focus on individual roles in the learning process, internal mechanisms and information processing elements (Tusting and Barton, 2006). According to cognitive theories, learning is defined as the increase in the mental capacity of a person.

According to Gestalt, which is the first approach in cognitive theory, thinking and learning activities take place in memory, and thinking activities are more important than stimulus-response relationship (İşman, 2003). Gestalt ideas are listed as follows (Yeşilyaprak, 2004):

- People perceive they saw as a whole.
- Perception of an element depends on its relationship with other elements.
- Behaviors are related to interpretation of situations faced by individuals, and they are the indication of one's learning.
- Learning is the change in individual's perception of situation he/she encounters.
- If all of the components of a subject are handled separately, the whole will not be seen.

Chang, Wilson and Dooley (2003), presented a computer application that has been redesigned with Gestalt principles and the first version of this application was given to nursing students. As a result of study's new design, 85% of users assessed the redesigned application positively.

According to Miller's Information Processing Theory, instant memory range contains restrictions on the amount of information we process and remember. Miller suggests that our capacity has some limits for processing information (Miller, 1955). Short-term memory's capacity has an average of seven units, but this capacity may vary plus or minus two units. Stack information divided into smaller pieces in instructional software is consistent with Miller's Information Processing Theory. Screens grouped as functional features reduce the duration of information search on the screen (Williams and Stimatz, 2005). In his work "Designing the User Interface", Shneiderman states that it is especially difficult for novice users to scan crowd displays (Williams and Stimatz, 2005). A lot of information in software displays cause excessive cognitive load and make a negative impact on content presentation. The amount of information displayed on the screen must be simplified or limited because more information on the screen causes an increase in the total capacity (Williams and Stimatz, 2005). Learning resources should meet the learner's needs and guide the learner effectively by recognizing the cognitive load of the items on each page (Oberfoell and Correiat, 2016).

INSTRUCTIONAL SOFTWARE AND PRINCIPLES OF SCREEN DESIGN

Instructional software is a specific educational tool, increasing the effectiveness of educational activities and which can be used in formal and informal education to teach a course. Teaching software design process is a multi-faceted research applied to various disciplines. In this regard, pedagogues, text writers, animators, filmmakers, system theorists, illustrators etc should be included in software design (Yurdakul, 2004).

The presentation of software contents is important for motivating students. Visually pleasing arrangements provide a focus on understanding the content. It will be useful to consider the following items in organising the software screen through data collected from literature survey:

- The collection of a large number of information on one screen increases the information load. With the organization of amount of information users will not be extremely loaded (Jones, 1995).
- Maps showing where users are should be provided on software screens (Jones, 1995). Thus, users will feel comfortable in learning environment.
- Lessons including animated characters, sounds and graphics motivate the students. However, when the components on the software screen such as text, animation, audio and film are not used for decorative purposes, it will contribute the users'duration of information process (Kılıç-Çakmak, 2007).
- Fields such as "sequential pipelines" should be found on the individual screens of the software (Larsen, 1995). Thus, the element of the software display is associated with the other elements of the screen at the same time (Larsen, 1995).
- Consistency in the display organization develops the learning process and facilitates the acceleration of information from one screen to another (Larsen, 1995).
- The effect of multimedia is greater than the sum of its elements. Thus, screen elements should be prepared with integrated perspective (Lee and Boling, 1996).
- Buttons, icons and menus should be emphasized to show the users a selection is made (Jones, 1995).

With instructional software screens, students should be motivated to explore the software content. Screens motivating students are important for effective explanation of lessons. However, unplanned screens have a negative effect on students' achievement and interest. In this regard, a good visual tool for communication attracts the attention of the recipient.

Referring to existing literature, an article, Using the Multi-Display Teaching System to Lower Cognitive Load was published in 2015 by Tsung-Sheng Cheng, Yu-Chun Lu and Chu-Sing Yang. In this study, an experiment was carried out with 120 college students as participants. According to the study results, multi-display instructional material significantly reduced cognitive load and enhanced learning effectiveness. An article, Understanding the Role of The Modality Principle in Multimedia Learning Environments was published in 2016 by A. Oberfoell and A. Correiat. According to this reasearch the retention and transfer of knowledge was not as effective for low-experience content users who viewed the narrated PowerPoint presentation. In fact, users who viewed the PowerPoint presentation that only included the on-screen text, had more effective retention and transfer of knowledge. A PhD thesis, The Effect of Screen Design on Learning on the Computer Instructional Software was published in 1997 by Halil İbrahim Bülbül. 32 standards related to the screen design of instructional software have been developed by this study. Also, a master thesis, The Evaluation of the Design Criteria of Web Based Computer Instruction was published in 2002 by Ahmet Arslan. In this study, web-based educational sites were examined in the light of design criteria. User Expectations Assessment Form and Website Analysis Form were used in this study.

The difference of this research from the other studies can be expressed as follows: Overall, previous studies seem to remain in theory without support by any application. The scale used in this study is different from other studies. And this study with the target group -sixth grade students- evaluating the educational software, is distinct from other studies.

METHOD

Research Design

This study was carried out with general screening model. In this model, a sample group that is taken from the universe provides a general judgement about the universe (Karasar, 2005). In the scope of this study, selected examples of current instructional software are evaluated in terms of graphics, text, animation, color, and screen layout. Then, principles for software screens are recommended in the light of learning theories and design principles.

For practical dimensions of the study, 142 people of sixth grade students evaluated the survey of Instructional Software Screen Design, and then students' opinions are analyzed about screen design of instructional software. Sample group of the study consisted of sixth grade students in Şehit Öğretmen Hasan Akan Elementary School. Sixth grade students were chosen with unmeasured sampling technique. According to this technique, all elements have an equal chance of being selected (Karasar, 2005). The sample group was residing in various districts of Asian side of Istanbul. So, the generalization of the study universe is increased.

The research is limited to Bilden, Eurosoft, and Kraker software. Also, the sample group is limited to sixth grade students in Şehit Öğretmen Hasan Akan Elemantary School.

Data Collection Tools

"Instructional Software Screen Design" questionnaire, which is created in the light of literature, is used for data collection. This questionnaire is developed by the researcher in order to evaluate the instructional software screens. Three questions about students' gender, age, and whether they have already worked with an instructional software are included in the questionnaire. Following these questions, in order to determine students' views on instructional software screens a 5-point Likert-type scale consisting of 40 items was prepared. Four of scale items were taken from "Effects of Screen Design to Active Learning Student Survey" which was created by Halil İbrahim Bülbül; one of scale items was taken from "Selçuk University Distance Learning Programme Web Site (Student)" which was created by Birol Gülnar; three of scale items were taken from "Instructional Web Software User Expectations Assessment Form" which was created by Ahmet Arslan; four of scale items were taken from "Educational Software Evaluation Survey" which was created by Bader Güneş; two of scale items were taken from "Software Evaluation Form" which was created by Aslıhan Tüfekçi Hotomaroğlu, and twenty six of scale items were created by researcher. 5-grading is determined as completely agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1). Eight of these substances are about text layout, nine of them about graphic layout, two of them about animations, three of them about colors and 18 of them about screen layout.

To determine the reliability of questionnaire items, outside the sample group of students, 139 sixth grade students completed the questionnaire in the same school. The validity of content of the questionnaire items has been examined by an expert and any necessary corrections were made afterwards. Item loads were analyzed. As a result of the application accompanied by an expert, reliability of questionnaire items, i.e. Cronbach's alpha reliability coefficient, is calculated as α: 0.919. After pilot study, all produced survey items were used in the original scale. Spearman-Brown coefficient was found 0,860 and Guttman coefficient was 0,849.
Before the application of the survey, students used Bilden, Eurosoft and Kraker software in their school computer lab. All subjects involved in software were examined and compared by the students. After reviewing software in the laboratory, Instructional Software Screen Design survey is given to students to obtain their opinions.

Data Analysis

Survey data where students' ideas are collected is processed with the SPSS 15 software. The data that are analyzed and processed with SPSS statistical methods in the study were interpreted to offer solutions. Questionnaire items were evaluated with single factor variance analysis for independent samples (one way ANOVA) and t-test for related samples (paired samples t-test). "Single factor variance analysis is applied to see whether or not there is a significant difference between two or more unrelated sample mean" (Büyüköztürk, 2006). "T-test is used to see whether or not there is a significant difference between two associated samples" (Büyüköztürk, 2006).

FINDINGS

Findings about Personal Information

As shown in Table 1, 66 female (46,5%) and 76 male (53,5 %) students participated the study.

Table 1. Gender

Gender	Number of Students	Percent (%)
Female	66	46,5
Male	76	53,5
Total	142	100,0

As shown in Table 2, 76 of students (53,5%) are 11 years old and 66 of these students are 12 years old (46,5%).

Table 2. Age

Age	Number of Students	Percent (%)
11	76	53,5
12	66	46,5
Total	142	100,0

As shown in Table 3, students (6,3 %) previously used an instructional software, while 133 students (93,7 %) students have never used an instructional software before.

Table 3. Experience

Experience	Number of Students	Percent (%)
Having Instructional Software Experience	9	6,3
Not Having Instructional Software Experience	133	93,7
Total	142	100,0

Findings and Interpretations Related to Instructional Software Comparison

Table 4 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the text layout. Furthermore, according to the results of Scheffe, test there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the text layout.

Table 4. Text Layout

	N	Average	Standard Deviation
Bilden	142	31,51	4,38
Eurosoft	142	30,04	4,91
Kraker	142	32,88	4,14
Total	426	31,48	4,62

Table 5 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the graphic layout. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the graphic layout.

Table 5. Graphic Layout

	N	Average	Standard Deviation
Bilden	142	36,51	5,78
Eurosoft	142	33,16	5,82
Kraker	142	37,53	4,68
Total	426	35,73	5,75

Table 6 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the animations. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft and Eurosoft-Kraker software in the animations.

Table 6. Animations

	N	Average	Standard Deviation
Bilden	142	7,98	2,04
Eurosoft	142	6,85	1,90
Kraker	142	8,11	1,81
Total	426	7,64	1,99

Table 7 shows that Bilden software has the highest scores and Eurosoft software has the lowest points in the colors. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft and Eurosoft-Kraker software in the colors.

Table 7. Colors

	N	Average	Standard Deviation
Bilden	142	12,44	2,47
Eurosoft	142	10,91	2,79
Kraker	142	12,29	2,51
Total	426	11,88	2,68

Table 8 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the screen layout. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the screen layout.

Table 8. Screen Layout

	N	Average	Standard Deviation
Bilden	142	72,20	11,35
Eurosoft	142	68,01	10,64
Kraker	142	74,60	10,09
Total	426	71,60	11,02

Table 9 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the total. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the total.

Table 9. General Total

	N	Average	Standard Deviation
Bilden	142	160,63	21,78
Eurosoft	142	148,97	21,26
Kraker	142	165,41	18,71
Total	426	158,34	21,71

Findings and Interpretations Related to Experience Variable

Students who have experience in using software gave lower scores than students who have no experience in graphical layout of Kraker software. Also students who have experience in using software gave lower scores than students who have no experience in the general total of Kraker software.

Findings and Interpretations Related to Age Variable

With respect to the age variable, there is no significant difference between three software. The reason for this can be the proximity of age levels.

Findings and Interpretations Related to Gender Variable

With respect to the gender variable, there is no significant difference between male and female students' software reviews.

CONCLUSION AND RECOMMENDATIONS

There is significant difference in text layout of three software. Font size is small for target audience in Eurosoft software. It is also more text-based. Long text descriptions are placed next to each image in Bilden software. Students will not get bored with texts in Kraker software which has highest scores and has larger font size than other software. Kraker is the most desirable software which has less text density. The comparison of three software's text layout is shown in Table 10. In addition, screenshots of Eurosoft, Bilden and Kraker software are shown in Figure 1, Figure 2 and Figure 3.

Table 10. Comparison of Eurosoft, Bilden and Kraker Software's Text Layout

Eurosoft	Bilden	Kraker
• Font size is small for target group • Text-oriented software	• Long text descriptions are placed next to visuals	• Larger font is used • Stimulating short text are included

Figure 1.Eurosoft software screenshot

Figure 2. Bilden software screenshot

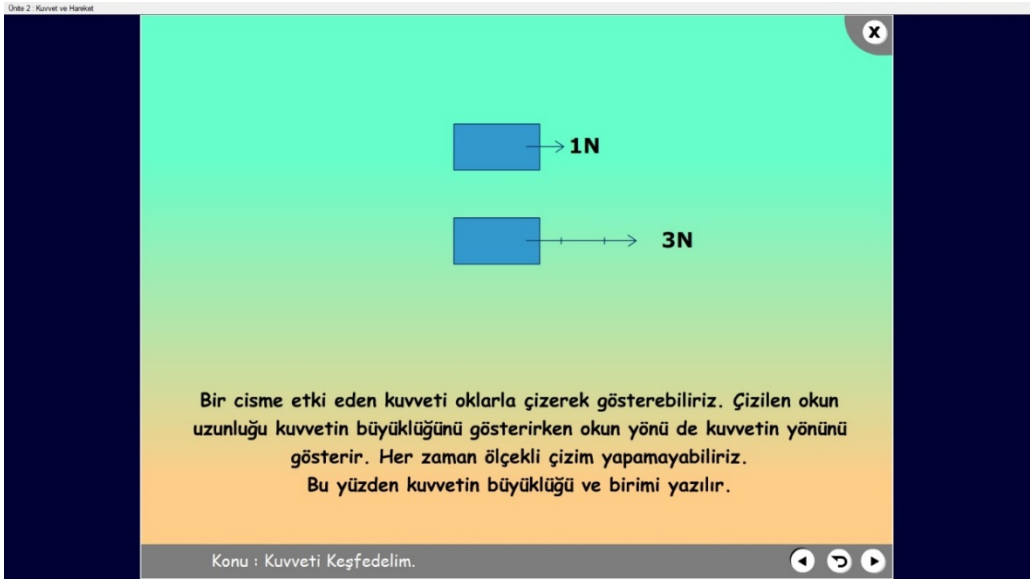


Figure 3. Kraker software screenshot

There is significant difference in graphic layout of three software. Simplicity and uncomplicated structure of graphics can be interpreted as an asset of Kraker software. The number of graphics in Eurosoft is lower than the other software. Graphics are not capable of supporting the students to focus on the lessons and they are far from attracting the attention of students. A variety of images are included in Bilden software. These images are located next to the texts. The comparison of three software's graphic layout is shown in Table 11.

Table 11. Comparison of Eurosoft, Bilden and Kraker Software's Graphic Layout

Eurosoft	Bilden	Kraker
• Few graphics are included. • Graphics are not capable of supporting the students to focus on the lessons and they have insufficient visuality to attract the attention of students	• Each subject includes various images	• Simple and uncomplicated graphics are included

There is significant difference between Eurosoft and the other two software in terms of animation. Animations in Eurosoft software are far from attracting the attention of students. Users control the animation display in Bilden software. Students appreciate the animations in Kraker software. The comparison of Eurosoft and the other two software's animations is shown in Table 12.

Table 12. Comparison of Eurosoft and Bilden-Kraker Software's Animations

Eurosoft	Bilden – Kraker
• Insufficient features that will attract the attention of students	• Animations of Kraker and Bilden Software are appreciated by the students

There is significant difference between Eurosoft and the other two software in terms of color. Blue hue is dominant in Eurosoft software. The number of colors used in graphics is limited in Eurosoft software. Mainly yellow, orange and red colors are used. With the usage of many colors, the other two software are very much appreciated. More vivid colors have won the highest scores by the students. The comparison of Eurosoft and the other two software's colors is shown in Table 13.

Table 13. Comparison of Eurosoft and Bilden-Kraker Software's Colors

Eurosoft	Bilden – Kraker
• Blue hue is dominant • The number of colors used in graphics is limited • The graphics are mainly yellow, orange and red	• With the usage of many colors, these software are appreciated by the students

There is significant difference in screen layout of three software. Kraker software can easily be used by the students. With simple screen design Kraker software's average is higher than the other two software. A large number of buttons are placed in Bilden software screen. In this sense, Bilden software is more detailed than Kraker software. Although easy to use, Eurosoft software does not encourage to discover itself. The comparison of three software's screen layout is involved in Table 14.

Table 14. Comparison of Eurosoft, Bilden and Kraker Software's Screen Layout

Eurosoft	Bilden	Kraker
• Although easy to use, software does not encourage to discover itself.	• Detailed screen design	• The software screen can easily be used by the students • The software has simple screen design

The Eurosoft software screenshot gives an impression of the course book organized in electronic environment. The screens in the software are static and monotone. Just the same screens that change in content cause the target group to get bored soon.

The presence of many applications dictionary, search, etc. can be considered as an important feature in terms of software density in Bilden software. But the button to which these applications take place is not recognized by some users. These situation results in the students never reaching these parts. It is important for students to be able to easily access the functions on the screenand to have these functions visible. Figure 4 shows the first position of the button and Figure 5 shows the button after clicking.

Figure 5. Bilden software screenshot – button first position

Figure 6. Bilden software screenshot – button after clicking

The graphics and animations in the Kraker software are simple and cute drawings. In this sense, the interest of the students keep alive. In Kraker software, images are weighted and software has less text than other software. In the software, different background colors and activities used on each screen enable the students to discover the software. Every activity on the software screen that is not similar to the previous screen keeps the interest of the students to the program.

Titles in the Kraker software are located at the bottom of the screen. Placing the topic title at the top of the screen will allow the student to pay attention to which topic is studying. Figure 7 shows that the topic title is positioned at the bottom of the screen.

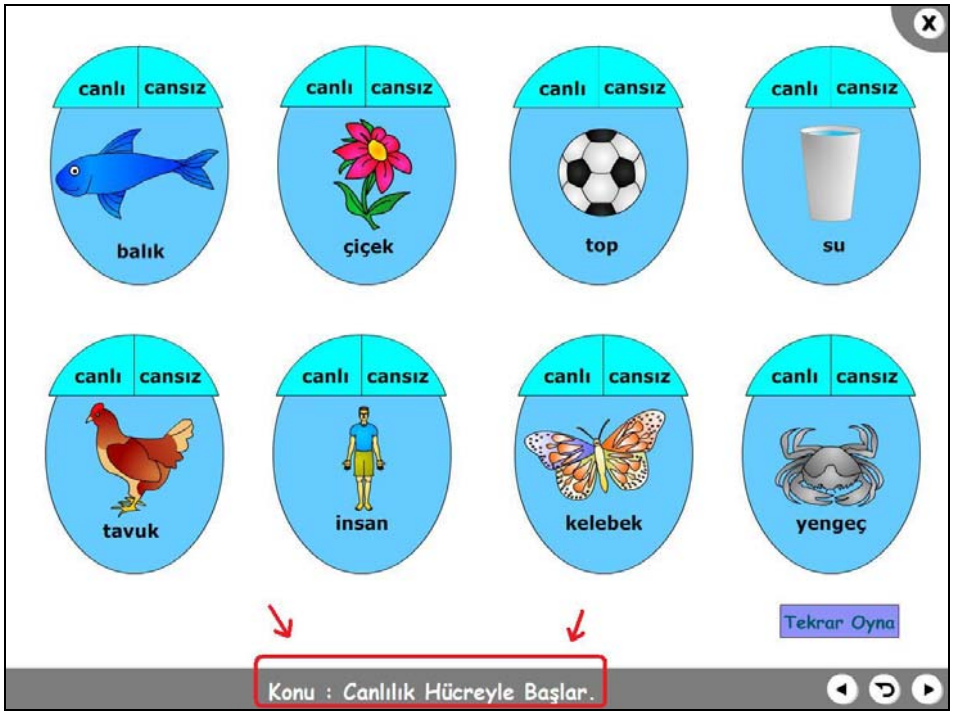


Figure 7. Kraker software screenshot – title positioned at the bottom of the screen

Overall Kraker is the most popular, and Eurosoft is the least popular software.
In the light of the findings, revision of educational software will be useful. Qualified screen designs will be created with user reviews and the studies made in this field. Approval of relevant experts should be obtained in

the process of educational software screen design and after being tested on subjects, screen designs proved to be productive and efficient can be used (Bülbül, 1997). Also, principles and methods of teaching should be taken into account in all phases of the educational software design (Arslan, 2002). The analysis of the target audience will enable the software screens to be well suited to users' needs. In this sense, design of simple line graphics and animations attracting students are important. Shorter animations, which can be controlled by the student, will be more beneficial. Important points about the subject especially should be intensified in animated areas because animated elements attractstudents' attention. The usage of colorful graphics to portray the static situations and different images that appeal to students in each case will encourage them to explore the software. Texts should emphasize important points in instructional software. Because of the screens with too much explanation users cannot decide which information is trivial. This situation will result in the overwhelming of user's memory with excessive cognitive load. In addition, user screens should be prepared in a simple way for adaptation of the students as soon as possible.

This study used a small sample of 142 participants and quantitative research often suggests the larger the sample, the richer the interpretation. The survey was evaluated only one school students. Another possible limitation of this study is the number of software: it is limited with Bilden, Eurosoft, and Kraker software.

This research seems scholarly important because of its contribution to effective design of instructional screens. It contributes to next studies by proposed criteria that instructional software screens must carry and by suggestions about current instructional software screens that are evaluated by students using software. This research is siginificant for being a guide to software developers with design principles and learning theories.

REFERENCES

Arslan, A., (2002). Web destekli bilgisayar öğretiminin tasarım kriterlerinin değerlendirilmesi [The Evaluation of the design criteria of web based computer instruction] (Master's Thesis), Marmara Universty, Istanbul.

Bülbül, H. İ., (1997). Bilgisayar öğretim yazılımlarında ekran tasarımının öğrenmeye etkisi [The Effect of screen design on learning on the computer instructional software] (Doctoral dissertation), Ankara Universty, Ankara.

Büyüköztürk, Ş., (2006). Sosyal bilimler için veri analizi el kitabı [The Data base hand book for social science], Ankara: Pegem A Yayıncılık.

Cheng, T., Lu, Y. and Yang, C., (2015). Using the multi-display teaching system to lower cognitive load, *Educational Technology & Society*, 18(4), 128-140.

Oberfoell, A. and Correiat, A., (2016). Understanding the role of the modality principle in multimedia learning environments, *Journal of Computer Assisted Learning*, 32, 607-617

Chang, D., Wilson C. and Dooley, L., (2003). Towards criteria for visual layout of instructional multimedia interfaces, *J. Educational Technology Systems*, 32(1) 3-29.

İşman, A., (2003). Öğretim teknolojileri ve materyal geliştirme [Educational technologies and material developing], Istanbul: Değişim Yayınları.

Johnson, G.M., (2014). The Ecology of interactive learning environments: Situating traditional theory, *Interactive Learning Environments*, 22(3), 298-308.

Jones, M. G., (1995). Visuals for information access: A new philosophy for screen and Interface Design. In D. G. Beauchamps, R. A. Braden & R. E. Griffin (Eds), Imagery and visual literacy (pp. 264-272). Blacksburg, VA: International Visual Literacy Association.

Karasar, N., (2005). Bilimsel araştırma yöntemi [Scientific research method], Ankara: Nobel Yayıncılık.

Kılıç-Çakmak, E., (2007). Arayüz tasarımında yeni bir yaklaşım: Paralel öğretim tasarımı [A new approach in interface design: Paralel instruction design], *Gazi University Journal of Gazi Educational Faculty*, 27(1), 1-22.

Larsen S., (1995). What is "quality" in the use of technology for children with learning disabilities?, *Learning Disability Quarterly*, 18(2), 118-130.

Lee, S. H. and Boling, E., (1996). Motivational screen design guidelines for effective computer-mediated instruction, *Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology*. Indianapolis, IN, 401–12. ERIC Document ED 397 811.

Miller, G. (1955). The magical number seven, plus or minus two some limits on our capacity for processing information, *Psychological Review*, 101(2), 343-352.

Tusting, K., Barton, D., (2006). Models of adult learning: A literature review. Leicester: NIACE.

Williams, B. O. and Stimatz, L. R., (2005). The Origins of graphic screen design principles: Theory or rhetoric?, *International Journal of Instructional Media*, 32(2), 181-193.

Yeşilyaprak B., (2004). Gelişim ve öğrenme psikolojisi [Development and educational psychology]. Ankara: Pegem A Yayıncılık.

Yurdakul, İ., (2004). Eğitim ortamında etkileşimli çokluortam CD-ROM'larının değerlendirilmesi [The Evaluation of interactive multimedia CD-ROMs in educational media], *The Turkish Online Journal of Educational Technology*, 3(4), 98-101.

APPENDIX

Instructional Software Screen Design Survey

Personal Information

1) Name Surname:
2) Gender: □ Female □ Male
3) Age: □ 10 □ 11 □ 12 □ 13
4) Have you ever studied with an instructional software before? □ Yes □ No
If yes, specify the names of these software:

The following evaluation sentences for instructional software screens are scaled from negative to positive 1 to 5. Please mark the most appropriate number for you when scaling these evaluation sentences.

Scale:
1: Strongly Disagree
2: Disagree
3: Undecided
4: Agree
5: Strongly Agree

TEXT LAYOUT

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. The letters on the screen are easy to read.	1	2	3	4	5
2. The spacing between the lines of text makes it difficult to read the text.	1	2	3	4	5
3. There are overloaded paragraphs on the screen.	1	2	3	4	5
4. The information in the subject is organized regularly.	1	2	3	4	5
5. Page titles cover the topics.	1	2	3	4	5
6. Significant parts of the topics are highlighted with italic letters, with different colours, with sparkle effect or with flashing effect.	1	2	3	4	5
7. Texts are created in length that does not exceed the user attention limit.	1	2	3	4	5
8. For each paragraph, the title that summarizes the paragraph content is used.	1	2	3	4	5

GRAPHIC LAYOUT

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
9. Graphics of the software facilitates the learning process.	1	2	3	4	5
10. The graphics used are suitable for learning level.	1	2	3	4	5
11.The graphics are complex and detailed.	1	2	3	4	5
12. The important parts of the subject are emphasized in the pictures used.	1	2	3	4	5
13. Graphics are not related to the content of the course.	1	2	3	4	5
14. The graphics have a visual structure that increases the motivation of the course.	1	2	3	4	5

15. Graphics are effective and appropriate for their purpose.	1	2	3	4	5
16. The picture related to a given text is displayed on the same screen with the picture.	1	2	3	4	5
17. The pictures and graphics used are simple enough to summarize the content.	1	2	3	4	5

ANIMATIONS

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
18. Animations are short enough to prevent users from getting bored.	1	2	3	4	5
19. Animations increase my interest in subject.	1	2	3	4	5

COLORS

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
20. Colour harmony is present on the screens.	1	2	3	4	5
21. The background colour and the colours of the elements on the screen do not make eye strain.	1	2	3	4	5
22. The colours used on the screen are effective and appropriate for their purposes.	1	2	3	4	5

SCREEN LAYOUT

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
23. The elements on the screen are balanced.	1	2	3	4	5
24. I can easily access the functions I'm looking for on the screen.	1	2	3	4	5
25. I can easily access home, help, exit, etc. menus.	1	2	3	4	5
26. The software is easy to use in general.	1	2	3	4	5
27. The software encourages you to discover the program by offering more than you can see at first glance.	1	2	3	4	5
28. I easily learned the use of the screens in a short time.	1	2	3	4	5
29. The number of steps that must be followed to complete a process is too many.	1	2	3	4	5
30. Important information on the screen can easily be distinguished.	1	2	3	4	5
31. Gaps are effectively used on the screen.	1	2	3	4	5
32. Menus are handy and easy to understand.	1	2	3	4	5
33. In the software, pages can be moved forward or backward and the desired page can be reached at any time.	1	2	3	4	5
34. Important points are emphasized in the software content.	1	2	3	4	5

35. The program screen is dense and complicated.	1	2	3	4	5
36. The program screen prompts learning during the course.	1	2	3	4	5
37. Screen design is intensifying and aesthetic.	1	2	3	4	5
38. There is harmony and consistency between the different screens.	1	2	3	4	5
39. The priority of the elements are well established on the screens.	1	2	3	4	5
40. The movement of the elements on the screen is suitable for natural eye movement.	1	2	3	4	5

Social Studies Teacher Candidates' Opinions about Digital Citizenship and its Place in Social Studies Teacher Training Program: A Comparison between the USA and Turkey*

Hıdır Karaduman
Anadolu University, Turkey
hidirk@anadolu.edu.tr

ABSTRACT
This research aims to determine and compare what social studies teacher candidates living in two different countries think about digital citizenship and its place within social studies and social studies teacher training program and to produce suggestions concerning digital citizenship education. Having a descriptive design, this research has employed a data collection tool developed in accordance with qualitative research method and consisting of open and closed-end questions directed to figure out teacher candidates' opinions about digital citizenship and its place in both social studies and social studies teacher training programs. The participants of the study are a total of 14 American (7 females-7 males) senior teacher candidates studying at Social Studies Teacher Training Program of a university located in East North Central region of the Midwestern United States and 51 Turkish (28 females-23 males) senior teacher candidates studying at Social Studies Teacher Training Porgram of a university located in the Central Anatolian Region of Turkey. Data collection took place in the spring term of 2012-2013 in both universities simultaneously. Research data has been analyzed through content analysis. Research findings have yielded that social studies teacher candidates participating from two different countries think that social studies course holds a major position with respect to digital citizensip education and that this course should be integrated with digital citizenship education. However, social studies teacher condidates in both countries have reported that either there are no topics or themes about digital citizenship within social studies course or they are insufficient and shallow. This study includes several suggestions concerning the incorporation of topics and themes about digital citizenship into social studies teacher training program.

Keywords: Social studies, digital citizenship, teacher candidate

INTRODUCTION

Together with the development of digital technologies, people's way of life and their interaction with each other and with the world have entered into a rapid transformation process (Palfrey and Gasser, 2008). Especially digitalization process in almost every aspect of daily life has led citizenship and relevant concepts to a technology based transformation (Isin & Ruppert 2015). In this sense, a new citizenship referred as digital citizenship (Rible 2006; ISTE [International Society for Technology in Education], 2007; Mossberger, Tolbert and McNeal, 2008; Churches, Crockett & Jukes, 2010; Greenhow, 2010; Farmer, 2010; Knorr, 2010) has taken its place within the literature.

ISTE (2007) defines digital citizenship as "to advocate and practice behaviors that enable legal, ethical, safe, and responsible use of info-communication technologies in online settings". Another definition of digital citizenship is to consider basic norms while using technology and act accordingly (Ribble and Bailey 2007). Digital citizens, on the other hand, are those "who have the skill to read, write, comprehend, and refer what they see online, who own broad-band access compatible with their economic limits, and who use the Internet regularly and efficiently" (Mossberger, Tolbert & McNeal, 2008). Farmer (2010) states that digital citizens can filter electronic information appropriately, participate in the cyber-space effectively, and who can make use of the information they learn online wisely in order for both personal and social development. Digital citizens think before acting, take the consequences into account, display a good command of ethics, and are aware of both risks and benefits of access to online materials (Churches, Crockett & Jukes, 2010). According to Knorr (2010), practicing safe and respnsible behaviors on the Internet is the key indicator of a well-established digital citizenship. The common points of all these definitions emphasize having access to the Internet and using it ethically and appropriately.

Ribble (2006) notes that digital citizenship has 9 dimensions which are ethics, access, law, literacy, communication, commerce, rights & responsibilities, privacy & safety, and health & wellness. Likewise, Jones & Mitchell (2015) state that the concept of digital citizenship refers to a wide range of target and that digital citizenship can be considered as responsible behaviors while using the Internet and partaking in Internet use

(online citizen participation). All these classifications are endeavors to meet ever-increasing need for digital citizenship education sufficiently since integration of digital technologies including mobile and social media tools has a deep impact over the lives of current students throughout the whole world along with the debate over digital citizenship and if any digital citizenship model exists or not (Searson, Hancock, Soheil, & Shepherd, 2015).

Children of the 21st century are growing at a time when use of the Internet becomes more and more common, and this easy access to information and sources of information introduces these children with both advantages and disadvantages of digital world (Hao, 2010). Digital world and the Internet furnish children with unique creativity and communication skills that make the entire planet more accessible at a very early age (Common Sense Media, 2009). Therefore, statistics show that students use the Internet very often, and this use is elevating rapidly day by day (Hollandsworth, Dowdy & Donovan, 2011). Miles (2011) underlines that keeping children away from digital and media culture makes them vulnerable against misuse of these technologies, and that children should be taught how to make reasonable decisions in online settings just as they are advised about how to make good decisions to be safe by their families and schools. Thus, Miles (2011) emphasizes that children should not be restricted from the advantages of the Internet due to potential dangers, rather they should be equipped with necessary knowledge and skills to explore the virtual reality safely and responsibly, and that the concept of rights and responsibilities should be expanded from the real world onto the Internet world.

A major part of responsibility falls onto families, educators, and educational institutions in terms of providing knowledge, skills, values, and attitudes necessary to explore the digital world. A digital citizenship terminology should be created by joint policies, standards, and a new understanding (Perle, 2009; Greenhow, 2010; Hollandsworth, Dowdy & Donovan, 2011; Searson, Hancock, Soheil, & Shepherd, 2015). It is a challenging process to develop a common understanding and to raise digital citizens, and students need especially the leadership of their teachers in the digital world (Nebel, Jamison, & Bennett, 2009). In this regard, teachers should strive to furnish their students with knowledge, skills, concepts, values, and attitudes in accordance with digital citizenship model.

As for Ribble (2006), one of the things that should be done for digital citizenship is that issues and skills related with digital citizenship should not be confined to computer laboratories, rather they should be incorporated into all disciplines and they should be indispensable components of all courses. Searson et.al (2015) underscore that digital citizenship should be should be integrated with all fundemental courses. Social studies is one of the courses that digital citizenship can be taught effectively. A study by Karaduman and Ozturk (2014) concludes that activities designed for digital citizenship and conducted within social studies course have a statistically significant effect over students' attitudes with respect to ethics & responsibilities, communication, privacy & safety, rights, and access. Including digital citizenship activities within social studies course, employing those activities efficiently, being a role model, and knowledge, skills, behaviors, and attitudes of both social studies teachers and social studies teacher candidates are considered meaningful in terms of enhacing this positive effect. In this sense, it is of great importance for especially social studies teacher candidates to have the competence to conduct digital citizenship education.

Berson and Balyta (2004) note that advances and innovations in technology require making amendments on social studies teacher training programs and integrating technology into teacher training programs in a way to enhance both teaching and learning. Similarly, Bennett and Scholes (2001) report that teacher candidates cannot utilize technology during learning and teaching activities if there is no sample integrated into their professional courses. Thus, integrating digital citizenship into social studies teacher training programs and providing teacher candidates with knowledge, skills, values, and attitudes are crucial for future practices.

Though literature holds both theoretical and empirical research studies focusing on digital citizenship within teacher training (Lee, 2006; Thieman, 2011; Sincar, 2012; Isman & Gungoren, 2013; Kaya & Kaya, 2014; Isman & Gungoren, 2014; Correa, Aberasturi-Apraiz & Gutierrez-Cabello, 2016), there is no specific study investigating what social studies teacher candidates think about digital citizenship and its place within both social studies course and social studies teacher training program. This research aims to determine and compare what social studies teacher candidates living in two different countries think about digital citizenship and its place within social studies and social studies teacher training program and to produce suggestions concerning digital citizenship education. Answers have been sought for the following questions:

1. What do social studies teacher candidates living in the USA and Turkey think about digital citizenship?
    1.1. How do social studies teacher candidates define digital citizenship?

1.2. According to social studies teacher candidates, what are the characteristics and skills that digital citizens should have?
1.3. How do social studies teacher candidates assess themselves in terms of digital citizenship?

2. What do social studies teacher candidates living in the USA and Turkey think about the place of digital citizenship in social studies course?
   2.1. What do social studies teacher candidates think about activities and practices that can be employed within social studies course for digital citizenship education?
   2.2. What do social studies teacher candidates think about the roles and responsibilities of social studies teachers in digital citizenship education?
3. What do American and Turkish social studies teacher candidates think about the place of digital citizenship within Social Studies Teacher Training Programs?

METHOD

Having a descriptive design, this research has employed a data collection tool developed in accordance with qualitative research method and consisting of open and closed-end questions directed to figure out teacher candidates' opinions regarding the reflection of technology onto values.

Participants

The participants of the study are a total of 14 American (7 females-7 males) senior teacher candidates studying at Social Studies Teacher Training Program of a university located in East North Central region of the Midwestern United States and 51 Turkish (28 females-23 males) senior teacher candidates studying at Social Studies Teacher Training Porgram of a university located in the Central Anatolian Region of Turkey. Relevant demographic information about the participants are given in Table 1:

Table 1. Demographic Features of American and Turkish Social Studies Teacher Candidates

		USA		TURKEY	
	Answer	Response	%	Response	%
The number of personal computers (desktop/ laptop/ tablet) owned by the teacher candidates	1	8	57	43	84
	2	4	29	6	12
	3	2	14	2	4
	4	0	0	0	0
	5	0	0	0	0
	More	0	0	0	0
	Total	14	100	51	100
The teacher candidates' responses regarding how long they have been using the Internet	0-2 years	0	0	2	4
	2-4 years	0	0	13	25
	4-6 years	1	7	12	24
	6-8 years	0	0	9	18
	More than 8 years	13	93	15	29
	Total	14	100	51	100
The daily amount of time dedicated to internet use by the teacher candidates	0-1 hours	0	0	11	22
	1-2 hours	2	14	17	33
	2-3 hours	2	14	13	25
	3-4 hours	5	36	3	6
	4-5 hours	4	29	5	10
	5-6 hours	0	0	1	2
	More than 6 hours	1	7	1	2
	Total	14	100	51	100
The number of e-mail accounts owned by the teacher candidates	0	0	0	0	0
	1	1	7	23	45
	2	8	57	21	41
	3	5	36	4	8
	4	0	0	2	4
	5	0	0	1	2
	More	0	0	0	0
	Total	14	100	51	100
	Desktop computer	4	29	17	33
	Laptop	13	93	42	82

Devices used by the teacher candidates to access internet	Netbook	0	0	9	18
	Smart phone	12	86	20	39
	Other	1	7	1	2
Reasons for internet use	Obtaining information	14	100	49	96
	Communication/ Establishing social relation	14	100	47	92
	Games/Entertainment	9	64	36	71
	Shopping	10	71	29	57
	Education	14	100	18	35
	Banking	11	79	13	25
	Other	1	7	4	8

A closer look at Table 1 reveals that American teacher candidates own more personal computers, that they started using the Internet earlier, that they spend more time on the Internet, and that they have more e-mail accounts than Turkish candidates. Laptop is the most frequently used digital device to get online by teacher candidates in both countries. Among the reasons of Internet use, obtaining information, communication/establishing social relations, and education are the most common ones for American teacher candidates. As for Turkish candidates, on the other hand, obtaining information, communication/establishing social relations, and games/entertainment are the most frequent reasons for Internet use. Furthermore, "facebook" is the answer to an open-end question about the most often visited website by the candidates in both countries. Of all the American candidates, 7 reported that they frequently check their facebook pages whereas 25 Turkish candidates noted a daily use of "facebook".

Data Collection Tool and Data Collection

A questionnaire form developed by the researcher and consisting of both open and closed-end questions was employed in order to collect data regarding teacher candidates' opinions about digital citizenship and its place in both social studies and social studies teacher training programs. "Open-end questions" or "open-end questionnaire" is one of the techniques utilized to collect qualitative data (Patton, 2002, Creswell, 2005). The questionnaire is composed of two parts. The first part contains closed-end questions directed to gather some personal information such as gender, the number of computers they have, how long they have been using the Internet and the length of daily Internet use, the number of e-mail accounts they have, digital devices they use to get online, the reasons to use Internet, and the most frequently visited websites. Yet, the second part of the questionnaire includes 8 open and 3 closed-end questions designed to determine teacher candidates' opinions about digital citizenship, its place in social studies, and how well it is integrated into social studies teacher training programs.

Data collection tool was developed based on the headlines distilled from meticulous literature review. Questions were prepared in acccordance with these headlines and the pool of questions was consulted with the experts. Feedback from the experts helped the researcher shape the draft copy of data collection tool. A pilot study was conducted on five teacher candidates in order to test the reliability of the data collection tool. Data collected from the pilot study was analyzed by the researcher and the tool was finalized. After finalizing the Turkish version of the questionnaire, it was translated into English, examined by language experts, pilotted on two teacher candidates, and then it was ready to use within the scope of this research.

Following the preparation of questionnaire forms, both universities granted the relevant consent to collect research data, and data collection started and finished during the spring term of 2012-2013 in both universities simultaneously. The questionnaire was administered to the American teacher candidates online and one-on-one by the researcher while Turkish candidates were given the questionnaire in an online setting.

Data Analysis

Data obtained from participating teacher candidates' answers to open-end questions within the questionnaire were analyzed via content analysis. Content analysis is a repeatable and systematic technique that summarizes the words of a text into smaller content categories through several codings based on certain rules, and its basic aim is to reach concepts and relations that can explain the collected data (Buyukozturk et.al, 2012; Yildirim and Simsek, 2005). During the analysis process, first the answers to open-end questions were typed and transfered into software format by the researcher. Subsequently, teacher candidates' opinions about the open-end questions were coded into one word or phrase that reflected the main idea by both the researcher and another researcher independently. Next, the codes were used to form themes, and codes and themes were matched. Afterwards, the codings by two researchers were compared and tested via Miles & Huberman formula (1994) (reliability

percentage = [agreement / (agreement + disagreement)] X 100), which resulted as 0.82. Data analyzed through content analysis was supported with direct quotations, which helped establish the reliability of the current study since direct quotations from the participants and presenting them with no add-ons increases the reliability for qualitative studies (Buyukozturk et.al., 2012). Internal validity of the current study was improved via independent analysis of research data by the researchers. Findings are presented in percentages and arithmetic means for closed-end questions and in frequencies for open-end questions; moreover, direct quotations are given from teacher candidates' opinions.

FINDINGS

Research findings are presented in tables that depict teacher candidates' perception of digital citizenship, the relation between digital citizenship and social studies course, and the place of digital citizenship in social studies teacher training programs.

Teacher candidates' perception of digital citizenship

Teacher Candidates' definitions of digital citizenship

Table 2:Teacher candidates' definition of digital citizenship

Turkey		The United States of America	
Conducting citizenship tasks on the Internet	21	Connecting with community via effective use of digital devices and the Internet	6
Using digital devices	6	Adopting an identity in online settings	2
Effective use of the Internet	6	Proper use of technology	2
Use of social networks	4	Becoming a good citizen in technology world	1
Proper use of technology	3	Becoming a member of digital world	1
Change of citizenship perception due to technology	3	Reflecting American citizenship onto digital settings	1
I have no idea	8	I have no idea	1
Total	51		14

As can be seen in Table 2, a significant part of Turkish participants defines digital citizenship as conducting their relationship with the state over the Internet within the limits of individual rights and responsibilities. For instance, teacher candidates numbered TR06 and TR18 underline use of the Internet for the relationship between the state and citizens in their definitions: *"I think it means being able to conduct citizenship transactions online. It means that citizens are able to conduct their tasks with state institutions and organizations over the Internet."* and *"Digital citizens are those who can follow their transactions with the state and its institutions and organizations in virtual settings and who can complete those tasks online."* respectively. As for Americans, it is possible to note that they mostly define digital citizenship as connecting with the community via effective use of digital devices and the Internet. In this regard, teacher candidate numbered USA04 said, *"Digital Citizenship means using technology to connect to your community through a means of computer, iphone, or et cetera. Defined to me as the connectedness of a society through technology. I do not think it is confined to just a community but instead a state or nation."*, and USA05 noted *"being competent with digital media. having the skills to connect to others proficiently through digital media."*.

A comparison between the definitions of digital citizenship by the American and Turkish teacher candidates indicates that Turkish candidates mostly regard the concept as being able to complete their citizenship tasks over the Internet while American candidates perceive digital citizenship as connecting with their community in online settings via effective use of digital devices and the Internet.

Characteristics and competences of digital citizens according to the teacher candidates

Table 3:Characteristics and competences of digital citizens according to the teacher candidates

Turkey		f	The United States of America		f
Skils		39	*Skills*		10
	Using the Internet	13		Communication and cooperation	3
	Using computers	8		Access to information tehchnologies	2
	Using technology	7		Creativity	2
	Digital literacy	5		Problem solving	1
	Accessing information	3		Technology literacy	1
	Critical literacy	1		Internet literacy	1

Media literacy	1		
Values and attitudes	12	*Values and attitudes*	8
Ethics	3	Being open to innovations	2
Respect	3	Respect	2
Responsibility	2	Responsibility	1
Self-control	1	Kindness	1
Being reliable	1	Ethic values	1
Being open to innovations	1	Being orderly	1
Having interest in technology	1		
Knowledge about	5	*Knowledge about*	4
Citizenship	3	Computer and Internet terminology	3
Rights and responsbilities	2	Current issues	1
Total	56		22

Table 3 depicts that Turkish teacher candidates analyzed the characteristics and competences that digital citizens should have under skills (39), values and attitudes (12), and knowledge (5). Accordingly, candidate TR03 said, *"They have to know how to use a computer. That is a must. Yet, the most basic one is responsible use of the Internet, they should be concientious*" and TR34 noted *"They have to be able to use the Internet to conduct their tasks and responsibilities at least."*.

Likewise, American teacher candidates grouped the characteristics and competences that digital citizens should have under skills (10), values and attitudes (8), and knowledge (4). In this sense, knowledge, skills, and attitudes regarding technology, computer, and Internet use were underlined. USA7 stated "*A digital citizen should have a working knowledge of how technology works and how to implement it in their everyday life. They need to be creative, hands on and have the ability to adapt to new and evolving sources of technology.*", and USA08 said "*A digital ciitzen should be accessing the internet multiple times a day, and be able to understand the basics of the Internet, along with the websites that they use*".

Teacher candidates' self-perceptions regarding digital citizenship

Table 4:Teacher candidates' self-perceptions regarding digital citizenship

Turkey		The United States of America	
	f		f
Yes	19	Yes	13
No	12		
Partially	12		
No idea	8	No idea	1
Total	51		14

Table 4 shows that some of the Turkish candidates see themselves as digital citizens. The candidates often relate this to "being able to effectively use the Internet and digital technologies to meet their individual needs and to complete their tasks with the state". For instance, TR04 said, *"Yes, I think so because I can manage most of my relation with the state in online settings*", and TR35 stated *"Yes, because I spend 3-to-4 hours online daily. I read, have fun, and meet my personal needs across websites…"*. A noteworthy finding is that almost half of the candidates replied as either 'no' or 'partially'. Those who do not regard themselves as digital citizens stated that they cannot use the Internet effectively, they do not prefer online settings, and that they don't have enough knowledge about it. Candidate TR28 replied as *"No, because I'm not that much into technology"*. Similarly, those who consider themselves as partial digital citizens noted that they felt like digital citizens in some aspects but on the whole they had lots of things to learn. Accordingly, candidate TR40 replied as *"Partially because I use the digital settings for my interests and to meet my needs, yet I do not know much about the safety and copyright issues in these settings"*.

Table 4 yields that all American teacher candidates, except for one, believe that they are digital citizens. That one candidate stated no idea since s/he did not know about the concept of digital citizenship. American teacher candidates explain the reason why they see themselves as digital citizens by noting that they have used the Internet and digital devices since they were born, and they made use of it efficently and regularly. In this sense, candidate USA03 said, *"Yes, because I use the internet a lot and have intergrated it into my everyday life. I also know how to effectively use it for a variety of tasks";* candidate USA08 stated, *"I do see myself as a digital citizen due to the amount of time that I am on the internet, along with the amount of knowledge I posses about the internet itself, and how to manage it. Growing up with computers, and technology, I believe my age is the*

most tech savy, and you can see this by walking through campus each day. Not only do we all use our laptops for classes, along with personal use, but we each have an Ipad, or Ipod, and a phone that we can access the web with", and candidate USA10 replied as *"Yes, I have been learning about the internet and how to utilize its potential in a safe way since I was a child. In other words, I grew up learning about the internet just as I grew up learning about my country"*.

The relation between social studeis course and digital ctizenship

The place of social studies course in digital citizenship education according to the teacher candidates

Table 5:The place of social studies course in digital citizenship education according to the teacher candidates

Turkey		The United States of America	
	f		f
Significant	11	Significant	4
Should be placed in social studies course	10	Should be placed in social studies course	4
Can be placed in social studies course	8	Digital tools and sources can be employed in social studies course	3
They are related	7	May be integrated in different ways	3
Social studies course includes digital citizenship	6		
The best course for digital citizenship education	5		
Social studies course does not have an effective role	2		
Total	49		14

Table 5 presents that social studies teacher candidates think that social studies course has a significant place in digital citizenship education. Teacher candidates attribute the foundations of this relationship to the fact that social studies course naturally deals with raising effective citizens, to its goals and content, to the fact that it prepares people for social life, to its interwoven nature with life, to the fact that it involves value education, to its systematic analysis of events in terms of past, present, and furture, and to the possiblity that technology may improve the effectiveness of social studies course. For instance, candidate TR04 said *"Social studies course prepares the community by all means. Thus, digital citizenship course should be incorporated into social studies"*, candidate TR29 noted *"Since social studies help individuals adapt themselves to life, it will be highly influential about this as well owing to the fact that this is a daily issue individuals encounter regularly"*, and candidate TR38 replied as *"Social studies course concerns daily life. I mean daily issues are involved within this course. Internet is a leading phenomenon these days. Therefore, it is a heavy part of social studies course"*.

Likewise, American teacher candidates also think that digital citizenship education and social studies course are highly related. They ascribe this relevance to the fact that social studies course is where citizenship education is conducted, to the goals and content of social studies course, to how social studies course reflects social life, to how digital settings help students build links among different individuals and cultures, and to the availability of tools and materials necessary for digital citizenship within social studies course. Accordingly, candidate USA07 stated that social studies and digital citizenship education can merge by many aspects by saying *"In social studies, you can incorporate digital citizenship in many ways. Webquests are a good way of utilizing technology and digital citizenship. Civics classes can have students do activities that focus on citizenship and the responsibilities of being a citizen"*. In addition, candidate USA10 noted that social studies course has an important place in digital citizenship education by saying *"I believe Social Studies has a very important place in digital citizenship education. This form of education allows students to internet with people they may otherwise never have the chance to interact with. Students can be exposed to many new experiences and gain wealth of knowledge"*. Similarly, candidate USA09 thinks that social studies may fulfil a major role for digital citizenship education by saying *"Social Studies courses can play a big part in digital citizenship, teaching students how to recognize a primary source online. Also, the internet is a place where people come together to discuss culture, society, and current events. It is important that Social Studies courses prepare their students for dissecting this information"*.

Teacher candidates' opinions about how important the aspects of digital citizenship are in social studies course

Table. 6: Turkish and American candidates' views on the importance of these aspects in social studies courses

How important are these aspects in social studies education	**Unimportant**		**Somewhat important**		**Important**		**Very important**		**Total Responses**		**Mean**	
	TR %	**USA** %	**TR** %	**USA** %	**TR** %	**USA** %	**TR** %	**USA** %	**TR**	**USA**	**TR**	**USA**
Digital Literacy	2.0	0.0	3.9	0.0	39.2	71.4	54.9	28.6	51	14	3.53	3.29
Digital Rights & Responsibilities	2.0	0.0	5.9	28.6	29.4	35.7	62.7	35.7	51	14	3.47	3.07
Digital Etiquette	5.9	0.0	5.9	14.3	35.3	50.0	52.9	35.7	51	14	3.37	3.21
Digital Communication	3.9	0.0	2.0	14.3	47.1	42.9	47.1	42.9	51	14	3.37	3.29
Digital Security (self-protection)	3.9	0.0	5.9	7.1	39.2	35.7	51.0	57.1	51	14	3.35	3.50
Digital Access	3.9	0.0	13.7	7.1	39.2	57.1	43.1	35.7	51	14	3.22	3.29
Digital Law	2.0	0.0	21.4	28.6	50.0	35.7	35.3	28.6	51	14	3.16	3.07
Digital Health & Wellness	7.8	7.1	15.7	50.0	37.3	35.7	39.2	7.1	51	14	3.08	2.43
Digital Commerce	7.8	0.0	37.3	28.6	37.3	50.0	17.6	21.4	51	14	2.65	2.93

Table 6 points that Turkish social studies teacher candidates consider some aspects of digital citizenship such as "digital literacy (3.53)", "digital rights and responsbilities (3.47)" and "digital etiquette (3.37)" more important than some others such as "digital commerce (2.65)", "digital wealth (3.08)", and "digital law (3.16)". On the other hand, social studies teacher candidates living in the USA think that several aspects of digital citizenship such as "digital security and privacy (3.50)", "digital literacy (3.29)" and "digital communication (3.29)" are more significant than some others such as "digital health (2.43)", "digital commerce (2.43)" and "digital rights and responsibilities (3.07)".

Digital citizenship in social studies course

The extent of topics and themes about digital citizenship in Social Studies Teacher Training Programs according to teacher candidates

Table 7: The extent of topics and themes about digital citizenship within the teacher training programs that the candidates study

Turkey		The United States of America	
	f		f
None	25	Partial or insufficient	5
Partial or insufficient	14	Yes	4
Yes	7	None	4
No reply	5	No reply	1
Total	51		14

A closer examination of Table 7 reveals that a majority of social studies teacher candidates living in Turkey stated that either no topic or theme about digital citizenship was included in their curriculum or it was insufficient and superficial. Teacher candidates noted that digital citizenship was only mentioned in one or two classes, that there was no practice, that faculty members were not enough about digital citizenship, that it was a new subject for everybody and therefore it was not included in the curriculum, and that some of them met with this concept for the first time when they took the questionnaire. Several candidates said the following: candidate TR38 *"I think we've learned nothing about digital citizenship in classess we've taken so far"*; candidate TR39 *"I'm a senior student in Social Studies Teacher Training, but I don't think we've studied anything about digital citizenship in our classes"*; candidate TR08 *"I don't think much has been said about it since it was only mentioned once in Science Technology and Social Change Course we took in the fourth term. Yet, there was nothing about practice"*; and candidate TR19 *"I think we've learned something about that in Science Technology and Social Change course we took during sophomore year. Plus, our teachers tell us about digital citizenship in several other courses*".

Another finding one can distill from Table 7 is that Amercan social studies teacher candidates think that topics and themes about digital citizenship are either ignored or partially covered in their classes, that these themes were studied in only few classes insufficiently, that lessons are generally instructed through use of powerpoint and students take notes, that modern technology is completely neglected in professional courses, and that practice was limited with using technology for instruction. For instance, following are two quotes examplifying the limited place of digital citizenship in social studies course: candidate USA04 *"Somewhat, we had one course over digital media"* and candidate USA14 *"Yes, but only in one education course education technology I learned everything I learn about digital citizenship in this one class"*. Still, candidate USA06 complained that digital citizenship is not properly included within the program *"I don't really see digital citizenship too often in my school. Many times, it is just a lecture where the teacher reads off a powerpoint and we copy down the notes"*.

Teacher candidates' views on digital citizenship knowledge, skills, values, and attitudes that they gained during their training

Table 8: Teacher candidates' views on digital citizenship knowledge, skills, values, and attitudes that they gained during their training

Turkey		The United States of America	
	f		f
No, I don't think I have	22	Yes, I think I have	6
Yes, I think I have	17	No, I don't think I have	4
I think I partially have	6	I think I partially have	3
No reply	6	No reply	1
Total	51		14

Table 8 shows that social studies teacher candidates living in Turkey replied the question "Have you gained any knowledge, skills, values, or attitudes about digital citizenship within social studies teacher training program you have been attending to?" as "No, I don't think I have", "Yes, I think I have", and "I think I partially have" respectively. However, the candidates did not explain much about the knowledge, skills, values, and attitudues they have learned. In this sense, they mostly referred to citing from online sources, quick access to online sources, digital literacy, digital communication, and respect for copyright. Accordingly, candidate TR38 stated that they have learned nothing about digital citizenship because there was no relevant activity in the program by saying *"There has been no activity designed to furnish us with relevant knowledge, skills, values, and attitudes in Social Studies Teacher Training Program"*. Yet, candidate TR33 refered to copyrights by stating *"… I learned about respecting copyrights in his/her course. Now, I'm more sensitive about using licensed software*; and candidate TR 20 underlined security and privacy issues by noting *"Yes, I have. We have to respect everybody's rights, especially when it comes to security and privacy of others"*.

Another finding presented in Table 8 is that social studies teacher candidates living in the States responded the question "Have you gained any knowledge, skills, values, or attitudes about digital citizenship within the social studies teacher training program you have been attanding to?" as "Yes, I think I have", "No, I don't think I have", and "I think I partially have" respectively. American teacher candidates often referred to educational technologies course and reported that they learned about digital rights, responsiblities, law, and access in that course and underpinned that they made use of the Internet for their assignments from other courses, which helped them improve their Internet skills. For instance, candidate USA14 pointed his/her gains about digital rights, responsibilities, law, and access in educational technologies course by clearly saying *"Yes, in the educational technology class we learn about digital rights and responsibilites, law and access"*; and candidate USA01 pointed his/her gains about digital literacy by saying "*Somewhat, I did use the internet and computers for many of my assignments. These skills contribute to the development of my digital literacy although they don't specifically address it*." Lastly, candidate USA013 noted that s/he had no gains by saying *"No I did not. I feel like my courses were taught more for the exams and not to provide extra learning"*.

Teacher candidates' knowledge about the dimensions of digital citizenship

Table 9: Turkish and American candidates' responses regarding their knowledge on the dimensions of digital citizenship

I know about....	None		Little		Some		A lot		Total Responses		Mean	
	TR %	USA %	TR %	USA %	TR %	USA %	TR %	USA %	TR	USA	TR	USA
Digital Communication	2.0	0.0	3.9	0.0	41.2	42.9	52.9	57.1	51	14	3.45	3.57
Digital Literacy	5.9	0.0	2.0	0.0	43.1	64.3	49.0	35.7	51	14	3.35	3.36
Digital Commerce	5.9	0.0	19.6	35.7	37.3	35.7	37.3	21.4	51	14	3.12	2.86
Digital Access	3.9	0.0	13.7	0.0	49.0	71.4	33.3	28.6	51	14	3.06	3.29
Digital Rights & Responsibilities	5.9	7.1	17.6	28.6	54.9	50.0	21.6	14.3	51	14	2.92	2.71
Digital Security (self-protection)	3.9	0.0	19.6	0.0	56.9	78.6	19.6	21.4	51	14	2.92	3.21
Digital Etiquette	5.9	0.0	29.4	7.1	45.1	64.3	19.6	28.6	51	14	2.78	3.21
Digital Health & Wellness	7.8	14.3	27.5	35.7	45.1	42.9	19.6	7.1	51	14	2.76	2.57
Digital Law	13.7	7.1	35.3%	35.7	37.3	50.0	13.7	7.1	51	14	2.51	2.43

As can be seen in Table 9, social studies teacher candidates in Turkey stated that they have more knowledge on "digital communication (3.45)", "digital literacy (3.35)", and "digital shopping (3.12)" than on "digital law (2.51)", "digital health (2.76)", and "digital etiquette (2.78)"'. On the other hand, social studies teacher candidates in the States noted that they knew more about "digital communication (3.57)", "digital literacy (3.36)", and "digital access (3.29)" than "digital health (2.43)", "digital law (2.57)", and "digital rights and resonsibilities (2.43)".

Suggesstions by teacher candidates in terms of what can be done to enhance social studies teacher candidates' knowledge, skills, and attitudes about digital citizenship

Table 10: Teacher candidates' opinions on what can be done to enhance social studies teacher candidates' knowledge, skills, and attitudes about digital citizenship

Turkey	f	The United States of America	f
About learning-teaching process	13	*About learning-teachning process*	6
Giving information about digital citizenship within the courses	6	Informing and teaching about digital citizenship	
Designing activities about digital citizenship	2	Providing opportunities for technology and computer use	
Homework assignment about digital citizenship	1	Holding debates about digital media	
Warnings about safe and unsafe websites	1	Integrating digital communication skills into courses	
Integrating topics such as Internet security, copyright, and citation into courses	1	Increasing practice opportunities to offer more experience	
About Social Studies Teacher Training Program	9	*About Social Studies Teacher Training Program*	3
Offering digital citizenship as a separate and elective course	5	Offering courses about technology and how to use technology in classes	2
Emphasizing digital citizenship within the program	3	Offering digital citizaenship as a separate course	1
Restructuring the contents of some courses within the program in accordance with digital citizenship	1		
About the faculty members	4	*About outside-class activities*	1
Improving themselves about digital citizenship	3	Conducting workshops about digital citizenship	1

	Designing research on digital citizenship	1
	Guiding students about digital citizenship	1
About outside-class activities		3
	Conducting outside-class activities and projects	2
	Conducting symposiums on digital citizenship	1
About teacher candidates		2
	Helping faculty members about how to reflect the aspects of digital citizenship onto the course content	1
	Improving themselves about digital citizenship	1
Total		56

As shown in Table 10, social studies teacher candidates from Turkey classified their suggestions to enhance social studies teacher candidates' knowledge, skills, and attitudes about digital citizenship under learning-teaching process, Social Studies Teacher Training Program, faculty members, outside-class activities, and teacher candidates. In this sense, suggestions regarding learning-teaching process and the program outnumber the others. Candidate TR38 suggested that digitial citizenship can be incorporated into the course via separate activities by saying *"First of all, some informing activities can be held. Since digital citizenship is not covered within the content of the course, separate activities can be designed."*. Likewise, candidate TR50 noted that the course can either be based heavily on digital citizenship topics or it can be offered as a separate course by saying *"There may be more emphasis on this field within the courses that we take as part of our teacher training program since they are covered so superficially in the current curriculum. Even, it can be integrated into the program as a separate elective class just like effective citizenship course. I feel that it is highly essential since we are te ones who will teach digital citizenship to next generations."*. In addition, candidate TR33 and TR40 supported these opinons by saying *"Computer class can be redesigned in a more active manner. New courses may be added because digital life is the most important topic of future"* and *"Different activities might be added to the courses in order to create awareness. It can be explained that using digital settings will be more rapid, secure, and beneficial with the new knowledge."* respectively.

Table 10 displays that social studies teacher candidates from the States made their suggestions to improve social studies teacher candidates' knowledge, skills, and attitudes about digital citizenship under learning-teaching process, Social Studies Teacher Training Program, and outside-class activities. Similar to their peers in Turkey, they also set forth more suggestions about learning-teaching process than others. Candidate USA02 who shared his/her opinions about this question emphasized that opportunities to use computers more often would better citizenship competences by saying *"Increased opportunities for use with technology. More computer time. More teaching geared toward skills within the framework of technology. ie formatting lesson plans, finding information, communicating appropriately on the computer."*. Moreover, candidate USA05 underlined the need for a separate digital citizenship course by saying "*I think a class dedicated to digital citizenship prior to our other education classes would be beneficial*.", and candidate USA09 pinpointed that workshops and supportive trainings would be meaningful by saying "*I think may be providing workships or help sesions to allow pre-service teachers to become better informed about digital citizenship*".

CONCLUSION and DISCUSSION

A comparison between the characteristics of teacher candidates from Turkey and the States indicates that those in the USA have been using the Internet for a longer time, allocate more time for Internet use on a daily basis, own more e-mail accounts, use the Internet more often on smart phones together with laptops, and make use of the Internet more comprehensively for various purposes than their peers in Turkey. "Facebook" is the most often visited website for both teacher candidate groups. Compatible with the current research findings, several studies in the literature have concluded that many teacher candidates have a facebook account and they use it for both education and communication needs regularly (Sendurur, Sendurur, and Yilmaz, 2015; Birinci and Karagozlu, 2016).

While managing citizenship tasks online is commonly underlined among the definitions of digital citizenship by Turkish teacher candidates, connecting with the community through effective use of digital tools and the Internet is noteworthy for the definitions provided by American teacher candidates. In this regard, it is possible to note

that teacher candidates from two countries perceive digital citizenship differently and that those in the States have defined the concept of digital citizenship more in detail consistently with the ones in the lterature (Mossberger, Tolbert ve McNeal, 2008; Farmer, 2010). However, both groups have referred to legal, ethical, moral, responsible, and safe use of digital tools and the Internet (more often underlined aspects of digital citizenship in the literature) (ISTE, 2007; Ribble and Bailey 2007; Churches, Crockett & Jukes, 2010; Knorr, 2010) less than expected in their definitions. Since these aspects are the focal point of digital citizenship, this may be an indicator of a major miss on behalf of social studies teacher candidates. Furthermore, almost all the teacher candidates from the States regard themselves as digital citizens within the boundaries of their definitions, and a significant portion of the particiapants from Turkey either do not consider themselves as digital citizens or they believe to be partial digital citizens. Because being a role model is one of the most important responsibilities of a teacher in digital citizenship training (Brooks-Young, 2007; Peckham, 2008; Perle, 2009; Farmer, 2010; Crocco & Leo, 2015), teacher candidates first should see themselves as digital citizens and then be role models for their students. In this sense, one can conclude that teacher candidates from the USA are more advantageous in terms of being a role model for their future students compared to Turkish peers because they both produced more comprehensive definitions of digital citizenship and regard themselves as digital citizens.

As research findings have indicated, both groups of participants have underpinned internet and computer literacy and general citizenship comptences with respect to characteristics and qualities that digital citizens should bear. Buente (2015) states that digital citizenship is a strong feature of a citizen who utilize the Internet consciously. Thus, the fact that both groups of teacher candidates from the two countries mentioned internet and computer literacy can be taken as a support for this view.

Similarly, teacher candidates from both countries believe that social studies course has great importance for digital citizenship education and that this course has to be associated with digital citizenship, which is consistent with Karaduman and Ozturk's study (2014) concluding that digital citizenship activities integrated with social studies have positively influenced students' digital citizenship attitudes and behaviors. Accordingly, teacher candidates' opinions also point to the significance of digital citizenship within social studies course.

In addition, both social studies teacher candidate groups have stated that they are most knowledgeable about "digital communication" aspect of digital citizenship. Ribble and Baily (2007) note that digital communication, digital access, and digital literacy are directly related with students' academic experiences. Besides, digital communication is the most frequently debated and referred aspect of digital citizenship within relevant literature. The reason why both teacher candidate groups are most informed about digital communication can be attributed to these two factors. On the other hand, "Digital law" and "Digital health" are two aspects that teacher candidates from the two countries are the least aware of. According to Ribble and Baily (2007), these two aspects are related with outside-school experiences. So, teacher candidates are least aware of these two aspects because they are not relevant to school life and candidates are hardly ever informed about them.

Research results have shown that social studies teacher candidates from Turkey think that topics and themes about digital citizenship are either superfically covered or not mentioned at all within social studies teacher training program. On the contrary, those in the States believe that they are incorporated, but somehow inadequately, into their teacher training program. This specific finding marks a major deficiency in social studies teacher training program about digital citizenship education in Turkey. The fact that majority of American social studies teacher candidates mostly answered the same question as partially or inadequately shows that there is a partial deficiency about digital citizenship education in the States. Berson and Balyta (2004) report that advances and changes in technology require making changes in the process of training social studies teachers. Bolick et.al (2003) note how important it is for teacher candidates to be good enough in technology and draw attention onto teacher trainers and teacher training programs. Therefore, the place of digital citizenship, which emerged as a reflection of recent advances in digital technologies onto citizenship training, has to be clarified and stabilized within social studies teacher training programs. Moreover, a significant portion of teacher candidates from Turkey think that they have learned no knowledge, skill, value, or attitude about digital citizenship as part of the curriculum of their teacher training program and American teacher candidates state that they either learned everything about digital citizenship during their education or they partially picked up some of those skills, values, and attitudes as part of their training program. Crocco and Leo (2015) note that social stuudies experts have recently become more informed and theoretically more sophisticated with respect to advantages and difficulties of digital technologies that either facilitate or impede social studies teacher training. Crocco and Leo's (2015) standpoint may explain as to why the definitions of American social studies teacher candidates are more comprehensive, why more space is allocated to topics and themes about digital citizenship within social studies teacher training program in the States, and why American candidates have picked up more knowledge, skills, values, and attitudes about digital citizenship during their education.

In accordance with research results and the opinions of teacher candidates from both Turkey and the USA, following may be suggested to effectively improve digital citizenship education within social studies teacher training programs:

- In line with the new mission assigned to citizenship concept as a result of technological advances, digital citizenship has to be granted a firm and stable space not only in social studies course within primary education but also in Social Studies Teacher Training Programs. In this regard, teacher candidates should be informed holistically about digital citizenship and its aspects through various courses in the Program.
- "Digital Citizenship Education" should be incorporated into Social Studies Teacher Training Program as an elective class in order to both inform the candidates and to furnish them with relevant knowledge, skills, and attitudes.
- Educational methodology courses should be enhanced with technology in order to offer practice to teacher candidates as to how they can conduct digital citizenship education in their future classes. Accordingly, faculty members should prepare practical activities and sample lesson plans in order to guide teacher candidates in terms of how to use technology and internet within social studies course.
- Faculty members who are expected to be role models for teacher candidates in technology use and digital citizenship should improve themselves with respect to technology use and internet, and faculties should design relevant seminars and training sessions.
- Faculty members should expand use of technology and the Internet in their courses and should be role models in terms of using them ethically and responsibly.
- Practical seminars and workshops should be designed about digital citizenship and digital citizenship education for teacher candidates.
- Classrooms where teacher candidates are trained should be redesigned to offer effective experience in technology use.

REFERENCES

Bennett, L., & Scholes, R. (2001). Goals and attitudes related to technology use in a social studies method course. *Contemporary Issues in Technology and Teacher Education*, *1*(3), 373-385.

Berson, M. J., & Balyta, P. (2004). Technological thinking and practice in the social studies: Transcending the tumultuous adolescence of reform. *Journal of Computing in Teacher Education*, *20*(4), 141-150.

Birinci, C. M., & Karagözlü, D. (2016). Determination of teacher candidates' anxiety levels on using facebook for instructional purposes. *World Journal on Educational Technology*, 8(1), 41-50.

Bolick, C., Berson, M., Coutts, C., & Heinecke, W. (2003). Technology applications in social studies teacher education: A survey of social studies methods faculty. *Contemporary Issues in Technology and Teacher Education*, *3*(3), 300-309.

Buente, W. (2015). Relating digital citizenship to informed citizenship online in the 2008 US presidential election. *Information Polity*, *20*(4), 269-285.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş. ve Demirel, F. (2012). *Bilimsel araştırma yöntemleri*. (5. baskı). Ankara: PegemA.

Churches, A., Crockett, L., & Jukes, I. (2010). *The digital diet: Today's digital tools in small bytes*. 21st Century Fluency Project.

Common Sense Media (2009). Digital life: Ourkids' connected culture. Retrieved November 16, 2013 from http://www.commonsensemedia.org/advice-for-parents/digital-life-our-kids-connected-culture

Correa, J. M., Aberasturi-Apraiz, E., & Gutierrez-Cabello, A. (2016). Digital citizenship, activism and teacher education of future teachers of early childhood education. *Revista Latinoamericana de TecnologiaEducativa-Relatec*, *15*(2), 39-54.

Creswell, J. W. (2005). *Educational research: planning, conducting, and evaluating quantitative and qualitative research* (2nd ed.). New Jersey, N.J.: Pearson Merrill Prentice Hall.

Crocco, M. S., & Leo, S. L. (2015). Commentary: digital citizenship: a response to Hicks et al.'s (2014) guidelines. *Contemporary Issues in Technology and Teacher Education*, *15*(1), 56-67.

Çubukcu, A., & Bayzan, Ş. (2013). Perception of digital citizenship in Turkey and methods of increasing this perception by using the internet conscious, safe and effective. *Middle Eastern & African Journal of Educational Research, (5),148-174.*

Farmer, L. (2010). 21. Century standarts for information literacy. *Leadership*, 39 (4), 20-22.

Greenhow, C. (2010). A new concept of citizenship for the digital age. *Learning & Leading with Technology*, 37 (6), 24-25.

Hao, Y. (2010). Integrating blogs in teacher education. Kidd, T.T. and Keengwe, J. (Ed.), *Adult learning in the digital age: perspectives on online technologies and outcomes* (p. 134-148). New York: IGI Global.

Hollandsworth, R., Dowdy, L., & Donovan, J. (2011). Digital citizenship in K-12: It takes a village. *TechTrends*, *55*(4), 37-47.
Isin, E., & Ruppert, E. (2015). *Being digital citizens*. Rowman & Littlefield International.
ISTE. (2007). National education technology standarts for students. Retrieved February 12, 2010 from http://www.iste.org/standards/nets-for-students/nets-student-standards-2007.aspx
Isman, A & Ozlem, C. G. (2013). Being digital citizen. *Procedia-Social and Behavioral Sciences* 106: 551-556.
Isman, A & Ozlem, C. G. (2014). Digital citizenship. *Turkish Online Journal of Educational Technology-TOJET* 13(1), 73-77.
Jones, L. M., & Mitchell, K. J. (2015). Defining and measuring youth digital citizenship. *New Media & Society*.
Karaduman, H., & Öztürk, C. (2014). The effects of activities for digital citizenship on students' attitudes toward digital citizenship and their reflections on students' understanding about digital citizenship. *Journal of Social Studies Education Research*, *5*(1), 38-78.
Kaya, A., & Kaya, B. (2014). Teacher candidates' perceptions of digital citizenship. *International Journal of Human Sciences*, *11*(2), 346-361.
Knorr, C. (2010). Be a Good Digital Citizen: Tips for Teens and Parents. Retrieved August 1, 2012 from https://www.commonsensemedia.org/blog/be-a-good-digital-citizen-tips-for-teens-and-parents
Lee, J. K. (2006). Pre-service social studies teachers using digital civic resources. *International Journal of Social Education*, *21*(1), 95-110.
Miles, D. (2011, June). Youthprotection: Digital citizenship—Principles & new resources. In *Cyber security Summit (WCS), 2011 Second World wide* (pp. 1-3). IEEE.
Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.
Mossberger, K., Tolbert, C. J., & McNeal R. (2008). Digital citizenship: the internet, society, and participation. London: The MIT Press.
Nebel, M., Jamison, B., & Bennett, L. (2009). Students as digital citizens on Web 2.0. *Social Studies and the Young Learner*, *21*(4), 5-7.
Palfrey, J., & Gasser, U. (2008). Born digital: understanding the first generation of digital natives. New York: Basic Books.
Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed). Thousand Oaks, CA: Sage.
Perle, L. (2009). Tech Talk: Beyond Internet Safety. Retrieved November 16, 2013 from http://www.commonsensemedia.org/advice-for-parents/tech-talk-beyond-internet-safety
Ribble, M.S. (2006). Implementing digital citizenship in schools: the research, development and validation of a technology leader's guide. (Doctoret tesis). Kansas: Kansas State University.
Ribble, M. and Bailey, G. (2007). *Digital citizenships in scholls.* Washington: ISTE.
Searson, M., Hancock, M., Soheil, N., & Shepherd, G. (2015). Digital citizenship within global contexts. *Education and Information Technologies*,*20*(4), 729-741.
Sendurur, P., Sendurur, E., & Yilmaz, R. (2015). Examination of the social network sites usage patterns of pre-service teachers. *Computers in Human Behavior*, *51*, 188-194.
Sincar, M. (2012). Examination of the inappropriate behaviors displayed by prospective teachers through digital devices in terms of certain variables. *Cukurova University Faculty of Education Journal* 42(1), 01-12.
Thieman, G. (2011). Emerging trends in digital citizenship in pre-service teacher practice. Oregon English Journal, 33(1), 41-45.
Yıldırım, A., & Şimşek, H. (2005). Sosyal bilimlerde nitel araştırma yöntemleri. *Ankara: Seçkin Yayıncılık.*

The Degree of Implementing ISTE Standards in Technical Education Colleges of Palestine

Fuad Ismail Ayad
Al Aqsa University-Gaza, Department of Technology Education
fuadayad@gmail.com

Sameh Jamil Ajrami
Al Aqsa University-Gaza, Department of Technology Education
samehjamil@hotmail.com

ABSTRACT
In light of this successive technological change, there has been an ongoing need for the development of technical education, so that the graduate is able to keep up with the requirements of the labor market on the one hand, and has a continuing education skills on the other. International Society for Technology in Education (ISTE) standards are considered as a vision for the development of education in general and technical education in particular in the light of these changes and requirements. The study aimed at examining the degree of implementing ISTE standards for teachers and students in technical education colleges in Gaza Strip of Palestine. The teachers' questionnaire was administered to 71 teachers of technical disciplines of engineering in four colleges of technical education in Gaza Strip. The students' questionnaire was administered to 186 students of technical disciplines of engineering in the four technical colleges. The results showed low degree of implementing ISTE standards for teachers and students in colleges of technical education, the percentages were 60.9%, 65.3% respectively. The study recommended holding scientific seminars and training courses for students and teachers in technical colleges to introduce ISTE standards, and encourage them to embrace these standards.

INTRODUCTION
The technical education is a formal education which includes educational skills, practical ability and scientific knowledge that are suitable for work requirements. It is basically aimed to prepare manpower that has skills and responsibilities of operating and maintaining industrial entities. Furthermore, it is characterized by its close association with the economic and social needs, and trends of technological development that the societies witness nowadays. This makes the new graduates of technical education programs responsible for the quick response to market needs with technical skills to achieve the society ambitions toward development and continual progress. Technical education is one which is skill-based, work focused, and prepares its recipient for the world of work by equipping them with the necessary skills, attitudes and knowledge required to fit into the workplace for today and the future (Oviawe, 2016). Technical education systems are expected to produce a new breed of competent workforce who can compete and excel in a rapidly changing environment and improve the country's economy. Technical education makes the single largest contribution in developing human resources in this age of technology. One can measure the technological development of a nation by looking at its technical education system. Technical education components are also continually generating a number of innovation and reforms in various aspects of technical education occurring at diploma and degree levels (Shamim, Aktaruzzaman & Clement, 2011). Technical education programs were designed to satisfy labour market demands in terms of making productively adequate trained personnel who are competent, nimble and highly equipped with employability skills ready for action without necessarily receiving additional training in summary, graduate employability in either self-employment or public sector has significant relationship with technical education programs. Hence, without the right skills, people are kept on the margins of society, technological progress does not translate into economic growth and countries can't compete in today's economies. It has been observed in some developing countries, the mismatch between applicants' qualification and labour market demand that reflects on the outdated skills taught by technical education institutions. The implication of the above shortfall is for the technical education institutions to adopt the key features in Globalization and Sustainability (Schleicher, 2012 cited in Bello, Shu'aibu, Saud & Buntat, 2013). Various studies and international experiments have pointed out the importance of technical education in advancing development and realizing its highest level. The development plans, regardless of their quality, cannot achieve their goals and required rates without qualified human resources scientifically and technically in all areas of work and production (Zian & Abd Al-Moneim, 2008). The basic aim of technical education centers on the achievement of socio-economic, industrial and technological objectives that will eventually manifest themselves in economic

stability, industrial harmony, technological advancement and improved standard of living for all. Therefore, the development of highly skilled workers of a country is a function of its well-placed priority on the standard of technical and vocational education (TVE) (Ben & Ashang, 2013).

In Palestine, technical education is a type of formal two-year post-secondary education, which includes educational preparation, and provision of the skills and professional knowledge, carried out by educational institutions formally in order to prepare skilled workers in various industrial, agricultural, commercial and health disciplines to equip them the ability of implementation and production. Therefore, the graduates are an important link between high technical frameworks qualified by universities and non-skilled workers who have not received any kind of formal education. The beginnings of technical education in Palestine go back to the last third of the twentieth century. In that period, lots of colleges and institutes specializing in technical programs were established. Many of the technical education colleges has been created in the last decade of the twentieth century in Gaza strip of Palestine. The most prominent of these colleges are: University College of Sciences and Technology (UCST) founded in 1990 in Khan Younis city, Palestine Technical College (PTC) founded in 1992 in Deir Al-balah city, University College of Applied Sciences (UCAS) founded in 1998 in Gaza city, Gaza Community/Training College (GCTC) founded in 2000 in Gaza city.

LITERATURE REVIEW

The most important problems encountering TVE is the lack of close connection of curricula with the reality of the profession, as well as the inadequacy of educational programs to the needs of the labor market, and thus the inability of graduates of technical education to compete with the labor force in the market (Halabi, 2012).
To prepare TVE students for the workplace, there is a need to provide them with the necessary and update skills to utilize modern technology in the service of economic and social developments and meet society needs. It is also important to link work with education through open and continuous education and society service. This imposes a reconsideration of the TVE programs and constructing their curricula and educational practices in the light of the educational technology Standards (Al-Shawabkeh, Mazahreh & Al-Kharabsheh, 2009).

Educational technology refers to the use of both physical hardware and educational theoretic. It encompasses several domains, including learning theory, computer-based training, online learning, and mobile technologies. Accordingly, there are several discrete aspects to describe the intellectual and technical development of educational technology (Babafemi, 2016):

- Educational technology as the theory and practice of educational approaches to learning.
- Educational technology as technological tools and media that assist in the communication of knowledge, and its development and exchange.
- Educational technology for Learning Management Systems (LMS), such as tools for student and curriculum management.
- Educational technology itself as an educational subject; such courses may be called "Computer Studies" or "Information and Communication Technology (ICT).

In recent decades, many scientific associations interested in producing educational technology standards for the development of learning environments and make them more effective and keep pace with technological innovations. International Society for technology in Education (ISTE) is one of the most prominent of these associations. It was established in 1979 as a non-profit organization for the purpose of functional and standardized used of educational technologies in USA. Among the most significant attempts of the institution is the National Educational Technology Standards (NETS) project started in 1993 to determine the standards that should be obeyed in educational institutions. The basic goal of this project is to improve the learning outcomes of the students by developing national standards regarding the educational use of technology. In the scope of this project, common standards for educational technologies and the related indicators were determined. These standards are intended to form a criterion for teachers, administrators and students (Kurt, Çoklar, Kilice & Yildirim, 2008).

The ISTE standards (formerly known as the NETS) are the definitive framework for successfully implementing digital strategies to positively impact learning, teaching and leading in our technology-powered world. They were developed with input from experts in the field and are widely recognized and adopted worldwide (ISTE standards at ISTE, 2015). The ISTE Standards are more than just abstract concepts. Students, educators, leaders and content creators around the globe use them as a guide in their shared mission to re-engineer education for the digital age (Standards inaction, 2016). ISTE has issued five types of standards namely: ISTE standards for administrators, ISTE standards for coaches, ISTE standards for computer science educators, ISTE standards for teachers, and ISTE standards for students. The current study focuses on the last two types. The following is a detailed presentation of them:

- ISTE standards for teachers: The version of these standards was adopted in 2008. It consists of five standards as follows (ISTE standards for teachers, 2008):
- Facilitate and inspire student learning and creativity.
- Design and develop digital age learning experiences and assessments.
- Model digital age work and learning.
- Promote and model digital citizenship and responsibility
- Engage in professional growth and leadership.
- ISTE standards for students: The version of these standards was adopted in 2007. It consists of six standards as follows (ISTE standards for students, 2007):
- Creativity and innovation.
- Communication and collaboration.
- Research and information fluency.
- Critical thinking, problem solving, and decision-making.
- Digital citizenship.
- Technology operations and concepts.

In light of the accelerating information revolution that we witness today, ISTE Standards are mainly based on the information and communication technology (ICT) which is considered today as the cornerstone of the development of the educational process in academic and technical programs in general. ICT is a diverse set of technological tools and resources used to communicate, create, disseminate, store and manage information. ICT have been flaunted as potentially powerful enabling tools for educational change and reform when appropriately used. The purpose of ICT is to increase productivity and efficiency and speed up information processing for wealth creation (Oviawe, 2016).

Ogunsola (2005) cited in Chukwuedo & Omofonmwan (2013) asserted that apart from acquisition and absorption of knowledge, ICT could offer developing countries unprecedented opportunities to change educational systems, improve policy formulation and execution, and widen the range of opportunities for business and for the poor. Kuhlemeier & Hemker (2007) cited in Tseng, Liang & Tsai (2014) emphasized that extending ICT skills has become one of the essential educational goals to better meet the needs of the digital age. Tsai (2009a) has pointed out that completing learning tasks requires an increasing involvement of students in using ICT.

ICT drives the new economy and human capital is its fuel. In fact, the ICT revolution makes knowledge a competitive resource. In this economic era, economic prosperity depends on brains rather than brawn and value is created by employing knowledge workers and continuous learning. The need for recurrent education and the changing labour market conditions, call for flexible access to TVE. Continuing education models that will meet workers' lifelong learning needs have to be relevant and flexible to provide just-in-time learning without distance (Chinien, 2003).

Chukwuedo & Omofonmwan (2013) believe that the acquisition of skills in TVE programs should be supported with sufficient ICTs in order to widen the skill-horizon of both teachers and students. Ben & Ashang (2013) show that the role of ICT in skilled manpower development through TVE among higher institutions cannot be overemphasized. In this technology-driven age, everyone needs ICT competence to survive. Chinien (2003) emphasizes that ICTs can play a crucial role in removing distance from education and in developing a lifelong learning culture in TVE. Shamim et al. (2011) found that using ICT in the teaching-learning process in TVE improves the quality of the education. The factors, stimulating the teachers of polytechnic institutions to use ICTs in teaching and learning, are as follows: they are economical, time saving, easy to prepare, attractive, easy to motivate the students, easy to administer, communication is easier, and easy to integrate. Ben & Ashang (2013) found out that ICT are playing significant role in skilled manpower development, especially in the area of engagement of technical students and strengthening technical teaching. Chukwuedo & Omofonmwan (2013) revealed that learners inescapably support their teaching-learning situation with ICTs. Therefore, the researchers concluded that ICTs are pillars of teaching and learning skills in the TVE.

Technical education is faced with the challenge of keeping up with the changes taking place in the world of work. The real of ICT is one that is growing limitlessly. It becomes imperative for technical teachers and students to focus on making technological learning part of their own lives so that it can be integrated into their instructional delivery competencies. They need to learn how to think, create, work, and collaborate with new ideas and techniques in order to properly integrate the use of ICTs into the teaching and learning process to avoid being left behind (Oviawe, 2016).

Although the interest of educators and general public in the use and integration of ICTs in education is on the increase, studies in this field are still in their infancy, especially those focusing on ICTs use in TVE (Saud et al., 2011). Here are the most important of these studies:
Oviawe (2016) concluded that ICT skills are the key things that will enable technical education graduates face the challenges of the 21st century workplace. It was recommended that government should provide enough funds to equip schools with ICT tools, equipment and facilities for better delivery of instruction.

Yasaka and Alias (2015) discussed the trend of ICT integration in teaching and learning in TVE based on a systematic review of ICT integration in post-secondary TVE. The findings showed that More effective integration is also indicated where the blended mode is adopted as compared to the fully ICT mediated mode.
Bello et al. (2013) concluded the importance of further review to explore the need for ICTs in TVE and recommended the procedures to be adopted in strengthening TVE curriculum to meet up with the global ICT skill challenges.

Virtič (2009) revealed that the students of technical education confirmed that in technical education different forms of e-learning were appropriate. A high percentage of teachers who regularly use educational portals indicate a great interest for the online social environment.

Chinien (2003) showed that there are many barriers that hinder the integration of ICTs into teaching and learning in TVE. The most significant are infrastructure, availability of suitable materials, job threat, appropriateness of the methods, and credibility of program content. Although there are some anecdotal records of successful attempts regarding the use of ICTs for teaching affective and practical skills, there is no hard evidence in support of these claims. It revealed that TVE teachers need to keep up to date in order to maintain their occupational literacy skills. Those involved in the integration of ICT-mediated learning need training in the pedagogical applications of ICTs for teaching and learning. Students also need a set of ICT literacy skills in order to succeed in ICT-mediated learning environments.

On the Arab level, there is a dearth of studies that combine between educational technology in general or ICT in particular, and technical education. Here are some of the studies, which focused on the educational domain in general:
Abu Jasser's study (2012) concluded the low educational supervisor's role in developing the international standards for technology in education for Teacher among secondary school teachers in Palestine. The study recommended the need to qualify and train teachers to employ international standards for technology in education better in the educational process.

Hinnawi's study (2010) revealed the weak role of Information Technology book of twelfth grade in Palestine to equip the students with some international standards for technology in education (Iste.S).

Al-zaboon & Ababneh's study (2010) confirmed that the teacher must possess the competences related to educational technology. The student's role should rise to become an active participant and producer of knowledge.

Abu Swawin & Abdel-jawad study's (2009) concluded that the degree of the exercise and the availability of educational technology competencies among secondary school teachers is medium, and did not meet the desired level.
Al-saif's study (2009) found that the degree of availability of the competencies of e-learning among faculty members is, in general, medium.
Al-shihry's study (2005) found that teachers' use of ICT and their application rate is generally low. The study has concluded that there is a need to develop comprehensive plans for the recruitment of technology in education.

Numerous researchers, who have studied the use of ICT in education have predominantly shown that the decisive factor for a successful implementation of ICT into education is the teacher. Teachers of technical education are in a way responsible for the competencies students acquire during their study. One of the competencies that are necessary for effective teaching is to adequately include ICT in classes and to foster information literacy among students (Virtič, 2009). Teachers need to plan thoughtfully before using ICT into educational process. for instance, they have to choose the correct ICT tools for particular learning objectives or contexts, modify existing resources or develop new learning environments to engage specific groups of learners, or decide scaffolding strategies for student-centred learning (Wang, 2008).

PROBLEM OF THE STUDY

The current study addresses a vital issue in the Palestinian environment, particularly in light of the increasing demand by students on technical education in recent years on the one hand, and the lack of studies that are interested in the link between educational technology standards and technical education at the Arab level on the other hand. So, the study aims at examining the degree of implementing ISTE standards for teachers and students at the disciplines of engineering in technical education colleges in Gaza Strip of Palestine. The researchers focused on the technical engineering disciplines for the following reasons:

- The technical engineering disciplines by their very nature require fast changing quantitative and qualitative practical knowledge. This forces teachers to continue developing their competencies in the areas of design and development of educational experiences, and handling digital tools and resources efficiently.
-
- The nature of studying these disciplines concentrates on project implementation and technological problem solving. Therefore, standards of educational technology became more urgent for the students to foster thinking skills, and enable them constantly to utilize digital tools and resources productively and efficiently.

Accordingly, the researchers formulated the problem of the study in the following main question: To what degree do the colleges of technical education in Gaza Strip implement the ISTE standards? The following sub-questions emerge from the above major one:

1. What is the degree of implementing ISTE standards for teachers in technical education colleges in Gaza Strip?
2. Are there statistically significant differences in the degree of implementing ISTE standards for teachers in technical education colleges in Gaza Strip due to the college variable?
3. What is the degree of implementing ISTE standards for students in technical education colleges in Gaza Strip?
4. Are there statistically significant differences in the degree of implementing ISTE standards for students in technical education colleges in Gaza Strip due to the college variable?

RESEARCH METHODOLOGY

The researchers followed the descriptive approach in translating ISTE standards for teachers and students into Arabic, in turning them into two questionnaires, one for teachers and other for students and then distributing them to a sample of teachers and students of technical engineering disciplines which is available at the following technical colleges in Gaza Strip:

- University College of Sciences and Technology (UCST).
- Palestine Technical College (PTC).
- University College of Applied Sciences (UCAS).
- Gaza Community/Training College (GCTC).

The two questionnaires were applied on the two samples during the second semester of the academic year 2015-2016. In regard to the teacher's questionnaire, it was distributed to all teachers of technical engineering disciplines in the previous mentioned four technical education colleges, and the number of those who responded to the questionnaire was (71). In regard to the student's questionnaire, it was distributed to a random sample of students of technical engineering disciplines in the four colleges, and the number of those who responded to the questionnaire was (186). Table 1 shows this.

Table 1: Distribution of the sample of teachers and students

College	UCST	PTC	GCTC	UCAS	Total
Teachers	17	21	14	19	71
Students	49	53	45	39	186

INSTRUMENTS

- QUESTIONNAIRE OF ISTE STANDARDS FOR TEACHERS

This questionnaire consists of (5) standards and (20) performance indicators, (4) performance indicators for each standard. To ensure of the validity of the questionnaire, it was administered to a group of arbitrators in the areas of technical education and educational technology. The researchers calculated the validity of internal consistency using Pearson correlation coefficients between the total scores of each standard and the total scores of the five standards. The coefficients were as follows (0.691, 0.554, 0.509 0.618, 0.712), and all the values are statistically significant at $p=0.01$. To ensure the reliability of the questionnaire, the researchers used the split-half technique, the overall reliability coefficient was (0.84). Besides, Kuder-Richardson20 *(K-R20)* was used, the overall reliability coefficient was (0.87). Further, a confirmatory factor analysis was implemented, it summarized all performance indicators into (5) factors given by table 2.The first factor is composed of the following performance indicators: Promote, support, and model creative and innovative thinking and inventiveness;

Engage students in exploring real-world issues and solving authentic problems using digital tools and resources; Promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes; Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments. These performance indicators are related to the first standard, which was named facilitate and inspire student learning and creativity. The second factor is composed of the following performance indicators**:** Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity; Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress; Customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources; Provide students with multiple and varied formative and summative assessments aligned with content and technology standards, and use resulting data to inform learning and teaching. These performance indicators are related to the second standard, which was named design and develop digital age learning experiences and assessments. The third factor is composed of the following performance indicators**:** Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations; Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation; Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital age media and formats; Model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning. These performance indicators are related to the third standard, which was named model digital age work and learning. The fourth factor is composed of the following performance indicators**:** Advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources; Address the diverse needs of all learners by using learner-centered strategies providing equitable access to appropriate digital tools and resources; Promote and model digital etiquette and responsible social interactions related to the use of technology and information; Develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital age communication and collaboration tools. These performance indicators are related to the fourth standard, which was named promote and model digital citizenship and responsibility. The fifth factor is composed of the following performance indicators**:** Participate in local and global learning communities to explore creative applications of technology to improve student learning; Exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others; Evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning; Contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community. These performance indicators are related to the fifth standard, which was named engage in professional growth and leadership.

Table 2 represents portion of each factor from the total common variance. As one may observe that about 72.7% percent of total common variance explained by these (5) factors.

Table 2: Factor analysis of performance indicators of ISTE standards for teachers

Factor name	Eigen value	Explained common variance by factor
Facilitate and inspire student learning and creativity	4.577	19.181%
Design and develop digital age learning experiences and assessments	3.991	17.323%
Model digital age work and learning	3.527	15.016%
Promote and model digital citizenship and responsibility	2.801	11.249%
Engage in professional growth and leadership	2.019	9.925%

- QUESTIONNAIRE OF ISTE STANDARDS FOR STUDENTS

This questionnaire consists of (6) standards and (24) performance indicators, (4) performance indicators for each standard. To ensure the validity of the questionnaire, it was administered to a group of arbitrators in the fields of technical education and educational technology. The researchers calculated the validity of internal consistency using Pearson correlation coefficients between the total scores of each standard and the total scores of the six standards. The coefficients were as follows (0.511., 0.499, 0.638, 0.595, 0.547, 0.612), and all the values are statistically significant at $p=0.01$. To ensure the reliability of the questionnaire, the researchers used the split-half technique, the overall reliability coefficient was (0.75). Besides, Kuder-Richardson20 *(K-R20)* was used, the overall reliability coefficient was (0.81). Further, a confirmatory factor analysis was implemented, it summarized all performance indicators into (6) factors given by table 3. The first factor is composed of the following

performance indicators: Apply existing knowledge to generate new ideas, products, or processes; Create original works as a means of personal or group expression; Use models and simulations to explore complex systems and issues; Identify trends and forecast possibilities. These performance indicators are related to the first standard, which was named creativity and innovation. The second factor is composed of the following performance indicators**:** Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media; Communicate information and ideas effectively to multiple audiences using a variety of media and formats; Develop cultural understanding and global awareness by engaging with learners of other cultures; Contribute to project teams to produce original works or solve problems. These performance indicators are related to the second standard, which was named communication and collaboration. The third factor is composed of the following performance indicators**:** Plan strategies to guide inquiry; Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media; Evaluate and select information sources and digital tools based on the appropriateness to specific tasks; Process data and report results. These performance indicators are related to the third standard, which was named research and information fluency. The fourth factor is composed of the following performance indicators**:** Identify and define authentic problems and significant questions for investigation; Plan and manage activities to develop a solution or complete a project; Collect and analyze data to identify solutions and/or make informed decisions; Use multiple processes and diverse perspectives to explore alternative solution. These performance indicators are related to the fourth standard, which was named critical thinking, problem solving, and decision making. The fifth factor is composed of the following performance indicators**:** Advocate and practice safe, legal, and responsible use of information and technology; Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity; Demonstrate personal responsibility for lifelong learning; Exhibit leadership for digital citizenship. These performance indicators are related to the fifth standard, which was named digital citizenship. The sixth factor is composed of the following performance indicators**:** Understand and use technology systems; Select and use applications effectively and productively; Troubleshoot systems and applications; Transfer current knowledge to learning of new technologies. These performance indicators are related to the sixth standard, which was named technology operations and concepts.

Table 3 represents portion of each factor from the total common variance. As one may observe that about 71.2% percent of total common variance explained by these (6) factors.

Table 3: Factor analysis of performance indicators of ISTE standards for students

Factor name	Eigen value	Explained common variance by factor
Creativity and innovation	4.15	20.39%
Communication and collaboration	3.29	15.46%
Research and information fluency	2.65	12.19%
Critical thinking, problem solving, and decision making	2.46	11.24%
Digital citizenship	1.53	6.22%
Technology operations and concepts	1.18	5.68%

In both questionnaires, a five–point Likert scale was used to identify the degree of implementing these standards in the colleges of technical education in Gaza Strip.

The Likert Scaling Technique

Table 4: The value of Likert scale (Five-point scale)

Responses Degree of implementation	Ranks
very high	5
high	4
Medium	3
Low	2
Very low	1

Collected data was analyzed depending on SPSS program by using the following statistical methods and techniques of analysis: Means, standard deviations and percentages; Kruskal-Wallis test; One-way analysis of variance; and Scheffe test.

The weighted average is used to represent the following criterion:

Table 5: Weighted average and its performance level

Responses Degree of implementation	Weighted Average	Percentage
very high	5≥WA>4.2	100≥WA>84%
high	4.2≥WA>3.4	84%≥WA>68%
Medium	3.4≥WA>2.6	68%≥WA>52%
Low	2.6≥WA>1.8	52%≥WA>36%
Very low	1.8≥WA≥1	36%≥WA≥20%

FINDINGS

To answer the first question, the researchers calculated the means, standard deviations, and the percentages of the responses of teachers to identify the degree of implementing each standard of ISTE standards for teachers and the five standards as a whole. Table 6 shows this.

Table 6: Degree of implementing ISTE standards for teachers

Standard	Means	SD.	Percentage
Facilitate and inspire student learning and creativity	56.94	7.11	56.9%
Design and develop digital age learning experiences and assessments	61.58	6.08	61.6%
Model digital age work and learning	62.94	5.93	62.9%
Promote and model digital citizenship and responsibility	57.47	7.55	57.5%
Engage in professional growth and leadership	63.36	6.25	63.4%
Total	60.86	6.42	60.9%

Table 6 shows that implementing ISTE standards for teachers as a whole is 60.9%, while the degree of implementing the five standards separately is 56.9%, 61.6%, 62.9%, 57.5%, 63.4% respectively. These percentages are all located in the medium level set by the researchers previously, which ranges from 52% -68%. It is clear from these results the low degree of implementing ISTE standards for teachers in the colleges of technical education in Gaza Strip.

To answer the second question, the researchers used Kruskal-Wallis test for differences in the mean scores of implementing ISTE standards for teachers due to college variable. Table 7 shows the result of this test.

Table 7: Kruskal-Wallis test

College	No.	Rank mean	FD.	Chi square
UCST	17	20.53	3	22.668*
PTC	21	29.93		
GCTC	14	45.32		
UCAS	19	49.68		

* significant at $p \leq 0.01$

It is clear from table 7 that the value of chi square test is *22.668*, which is statistically significant at $p= 0.01$, and this indicates that there are significant differences in the degree of implementing ISTE standards for teachers in the technical education colleges in Gaza Strip attributed to the variable of college. The value of the rank mean for the teachers of UCAS is greater than any other rank for teachers of the three other colleges. Therefore, the differences among the mean scores are in favor of teachers of UCAS.

To answer the third question, the researchers calculated the means, standard deviations and the percentages of the responses of students to identify the degree of implementing each standard of ISTE standards for students and the six standards as a whole. Table 8 illustrates this.

Table 8: Degree of implementing ISTE standards for students

Standard	Mean	SD.	Percentage
Creativity and innovation	77.27	9.07	64.4%
Communication and collaboration	80.33	7.52	66.9%

Research and information fluency	81.41	7.71	67.8%
Critical thinking, problem solving, and decision making	76.30	9.10	63.6%
Digital citizenship	80.15	8.77	66.8%
Technology operations and concepts	72.08	7.95	60.1%
Total	78.31	8.22	65.3%

Table 8 shows that implementing ISTE standards for students as a whole is 65.3%, while the degree of implementing the six standards separately is 64.4%, 66.9%, 67.8%, 63.6%, 66.8, 60.1 respectively. These percentages are seen at medium level set by the researchers previously which ranges from 52%-68%. It is clear from these results the low degree of implementing ISTE standards for students in the colleges of technical education in Gaza Strip.

To answer the fourth question, the researchers used one-way analysis of variance for differences in the mean scores of the implementing of ISTE standards for students due to college variable. Table 9 shows the result of this test.

Table 9: One-way analysis of variance

	Source of variance	**Total of squares**	**FD.**	**Mean of squares**	**F. value**
Degree of implementing	Between groups	1822.59	3	607.531	7.770*
	In groups	14231.32	182	78.194	
	Total	16053.91	185		

* significant at $p \leq 0.01$

As shown in table 9 the value of *(F)* is statistically significant at $p= 0.01$, and this indicates that there are significant differences in the degree of implementing ISTE standards for students due to the college variable. To identify the significant bilateral differences between groups (the four colleges of technical education) in the degree of implementing ISTE standards for students, Scheffe test was used to make post comparisons. Table 10 illustrates this.

Table 10: Results of Scheffe test of post comparisons due to college variable

College1	**College2**	**Difference between means**	**Sig. level**
GCTC	PTC	6.26080*	0.000
	UCST	3.63349	0.355
	UCAS	4.42368	0.107
UCST	PTC	2.63130	0.546
	UCAS	0.79018	0.958
	GCTC	-3.63349	0.355
UCAS	PTC	1.84712	0.794
	UCST	- 0.79018	0.958
	GCTC	- 4.42368	0.107

* significant at $p \leq 0.01$

It is clear from table 10 that there is a statistically significant difference at $p=0.01$ in the degree of implementing ISTE standards for students between GCTC and the PTC, in favor of the GCTC student.

DISCUSSION

The present study aimed at identifying the degree of implementing ISTE standards for teachers and students in technical education colleges in Gaza Strip.

In regard to the first question, the results showed a low degree of implementing ISTE standards for teachers in technical education colleges in Gaza Strip. This result agreed with those of Chinien (2003), Al-shihry (2005), Abu Swawin & Abdel-Jawad (2009), Al-saif (2009), and Abu Jasser (2012), while differed with those of Virtič (2009), and Yasaka and Alias (2015). This result could be attributed to the lack of attention on the part of the top management in these colleges toward educational technology issues in general and e-learning in particular. Meeting these standards requires these colleges to provide more hardware and software equipment related to virtual learning environments and contemporary digital tools. These educational institutions and their teachers also lacked continuous development of professional practices needed by the teachers in terms of design and development of learning experiences**,** which are based on the integration between the digital tools and resources on one hand, and using creative teaching skills for the construction of information among students in virtual and face-to-face environments on other hand. Besides, the speed of technological developments in the field of ICT

make it difficult for teachers to keep up with them, as some may create a state of reluctance to follow modern scientific studies and research related to the effective teaching through virtual learning environments.

In regard to the second question, the results showed that there are statistically significant differences at *p=0.01* in the degree of implementing ISTE standards for teachers in technical education colleges in Gaza Strip due to the college variable, and in favor of the UCAS teachers. This result may be attributed to the fact that UCAS has educational facilities and equipment more than any other technical college in Gaza Strip. It is the most prominent technical colleges that interested of blending learning which combines between classroom teaching and virtual learning, it has been recruiting learning management system (Moodle) efficiently for more than ten years. It has also a specialized technical staff that provides teachers with an acceptable level of services and advices they need in the development of teaching performance through digital media and virtual learning environments. Furthermore, UCAS requires the teacher to work with to have the necessary competence for effective teaching based on the employment of different information resources.

In regard to the third question, the results showed a low degree of implementing ISTE standards for students in the colleges of technical education in Gaza Strip. This result agreed with those of Chinien (2003), and Hinnawi (2010), while differed with those of Virtič (2009), and Yasaka and Alias (2015). It is intuitively that the low degree of implementing ISTE standards for teachers negatively effect in the degree of implementing ISTE standards for students in technical education colleges. This result also may be attributed to these standards which are, in fact, new international standards that require a relatively long time to become part of the technological culture of students in technical educational institutions. On the other hand, the technical education students are often low achievers in the secondary school certificate, which in turn makes us wonder about the seriousness of these students in understanding digital technology systems let alone employing them productively and effectively in the learning process.

In regard to the fourth question, the results showed that there are statistically significant differences at *p=0.01* in the degree of implementing ISTE standards for students in technical education colleges attributed to the college variable, and in favor of the GCTC students. This result is attributed to the fact that the GCTC is an institute run by International Relief and Works Agency, which has a privileged teaching staff that receive annually many international training courses in different educational areas notably in the educational technology field. Besides, there are also sufficient and modern educational facilities and equipment at the college, and it has a highly experienced and disciplined administrative body. These factors, no doubt, have a significant impact on attracting high school students with higher academic and intellectual levels. These factors also contribute to the development of students' competencies in the field of knowledge construction, and the recruitment of information resources and digital tools productively and effectively in the learning process.

CONCLUSION AND RECOMMENDATION

The findings of this study showed a low degree of implementing ISTE standards for teachers in colleges of technical education in Gaza Strip. Besides, there are statistically significant differences between those teachers in the degree of implementing ISTE standards attributed to the college variable, and in favor of the UCAS teachers. The findings also showed a low degree of implementing ISTE standards for students in colleges of technical education in Gaza Strip. Besides, there are statistically significant differences between those students in the degree of implementing ISTE standards attributed to the college variable**,** and in favor of the GCTC students. In order to raise the degree of implementing ISTE standards for teachers and students, it is recommended to:

- Hold scientific seminars and training courses for students and teachers in technical colleges to introduce ISTE standards, and encourage and motivate teachers and students to embrace these standards.
- Integrate ISTE standards in pre-service academic preparation programs for teachers of technical education.
- Provide technical education colleges in Gaza Strip by appropriate infrastructure in ICT field to help students and teachers in implementing ISTE standards.
- Enhance technical education teachers' awareness of the importance of utilizing digital tools and resources, and virtual learning environments in the design, development and evaluation of learning experiences in order to develop the students' specialized competencies to the utmost level.
- Work on the development of teacher professional practice and lifelong learning constantly.
- Conduct ongoing evaluation for programs and courses in technical education in the light of ISTE standards, and the rapid and extensive development of the digital information and technology.
- Study the obstacles and problems facing the application of ISTE standards in various technical disciplines.
- study the views and opinions of the leaders of technical education colleges about the extent of implementing ISTE standards in their colleges.
- Study the implementation of ISTE standards in academic programs, schools and universities in general.

LIMITATIONS OF THE STUDY

The findings of this study are constrained by some limitations, which similar studies in future should address. First, the current study only focused on the engineering disciplines, so it cannot be generalized the findings to all technical education disciplines. Second, the current study was conducted in Gaza Strip, which represents the southern provinces in Palestine, so it cannot be generalized the findings to the northern provinces. Third, to get more accurate and credible findings, it is required further research and investigation about the skills of graduates and the extent of their implementation of these standards in the labor market. Fifth, many students and teachers did not respond to the questionnaire, therefore, it is preferred in future studies to expand the sample to get more accurate findings.

REFERENCES

Abu Jasser, M. (2012). *The role of the educational supervisor in the development of competencies of information technology for secondary school teachers in Palestine in accordance with international standards* (Unpublished master thesis), Al-Azhar University - Gaza, Palestine.

Abu Swawin, R. & Abdel-jawad, I. (2009, November 18). *Competencies of technology teachers in education technology and the degree of exercising them in high school*. Paper presented at the second Educational Conference "The Role of Higher Education in the Overall Development", Al-Azhar University, Gaza-Palestine.

Al-saif, M. (2009). *The availability of e-learning its constraints and development as perceived by the teaching staff of the Faculty of Education at King Saud University* (Unpublished master thesis), King Saud University, Saudi Arabia.

Al-shawabkeh, A., Mazahreh, A. & Al-Kharabsheh, M-R. (2009). The development of technical and vocational education in Jordan, reality and prospects. *Scientific Journal of college of Education-Asuoot University, 25*(2), 252- 278.

Al-shihry, M. (2005). The role of the teacher in the information age. *Arab libraries and information Journal, 4*, 32-5, Saudi Arabia.

Al-zaboon, M. & Ababneh, S. (2010). Perceptions of the use of information and communication technology in the development of the educational system. *Al-Najah University Journal for Research (Humanities), 24*, 1-28, Palestine.

Babafemi, M.(2016). Information and communication technology (ICT) in technical education. *SCIREA Journal of Education, 1*(1), 79-87.

Bello, H., Shu'aibu, B., Saud, M. & Buntat, Y. (2013). ICT Skills for Technical and Vocational Education Graduates' Employability. *World Applied Sciences Journal, 23* (2), 204-207.

Ben, C. & Ashang, M. (2013). The role of ICT in skilled manpower development through vocational technical education among higher institutions in Cross River State, Nigeria. *International Journal of Vocational and Technical Education, 5*(5), 92-99.

Chinien, C. (2003). Analytical survey: The use of ICTs in technical and vocational education and training. *UNESCO Institute for Information Technologies in Education,* United Nations Educational, Scientific and Cultural Organization, Moscow.

Chukwuedo, S. & Omofonmwan, G. (2013). Information and communication technology: The pivot of teaching and learning of skills in electrical and electronics technology program in Nigeria. *International Journal of Vocational and Technical Education, 5*(6), 117 - 123.

Halabi, S. (2012). The reality of vocational and technical education and its problems in the Arab world: The case of Syrian Arab Republic. *Al-Quds Open University Journal for Research and Studies, 28*(2), 397-434.

Hinnawi, Hamid (2010). *The role of twelfth grade technology book in equipping students with some global standards for information technology* (Unpublished master thesis), the Islamic University, Gaza-Palestine.

ISTE standards at ISTE (2015). *ISTE website.* Retrieved May 16, 2016, from https://www.isteconference.org/2015/program/iste_standards.php.

ISTE standards for Students (2007). *ISTE website.* Retrieved May 16, 2016, from http://www.iste.org/standards/standards-for-students.

ISTE standards for teachers (2008). *ISTE website.* Retrieved May 16, 2016, from http://www.iste.org/standards/standards-for-teachers.

Kuhlemeier, H. & Hemker, B. (2007). The impact of computer use at home on students' Internet skills. *Computers & Education, 49*(2), 460-480.

Kurt, A, Çoklar A., Kilicer, K. & Yildirim, Y. (2008). Evaluation of the skills of K-12 students regarding the national educational technology standards for students (NETS*S) in Turkey. *The Turkish Online Journal of Educational Technology – TOJET, 7*(3), 6-14.

Ogunsola, LA. (2005). Information and Communication Technologies and The Effect of Globalization: Twenty-first Century "Digital Slavery" for Developing Country-Myth or Reality? *Electronic Journal of Academic and Special Librarianship, 6*(1-2)**.** Retrieved from http://www.devilfinder.com.

Oviawe, J. (2016). Information and Communication Technology in Technical Education. *Advances in Social Sciences Research Journal, 3*(5), 70-79.

Saud, m., Shuaibu, B., Tahir, L., Buntat, Y., Yahaya, N. & Gital, A. (2011). Applicability of information and communication technologies (ICTs) in the administration of technical and vocational education and training (TVET) in a knowledge-based society. *International Journal of the Physical Sciences, 6*(28), 6513-6520.

Schleicher, A., 2012. *It all starts with building the right skills.* Global perspectives on education.

Shamim, Md., Aktaruzzaman, Md. & Clement, C. (2011). Factors influencing use of ICT in Technical &Vocational Education to make teaching-learning effective & efficient: Case study of Polytechnic institutions in Bangladesh. *International Journal of Basic & Applied Sciences IJBAS-IJENS, 11*(3), 164-170.

Standards inaction (2016). *ISTE website.* Retrieved May 16, 2016, from http://www.iste.org/standards/standards-in-action.

Tsai, M-J. (2009a). Online information searching strategy inventory (OISSI): A quick version and a complete version. *Computers & Education, 53*(2), 473-483.

Tseng, S-C., Liang, J-C. & Tsai, C-C. (2014). Students' self-regulated learning, online information evaluative standards and online academic searching strategies**.** *Australasian Journal of Educational Technology, 30*(1), 106-121.

Virtič, M. (2009). Model of ICT implementation in the technical education. *Problems of Education in the 21st Century, 14*, 144-158.

Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International, 45*(4), 411–419.

Yasaka, Z. & Alias, M. (2015). ICT integrations in TVET: Is it up to expectations? Fourth World Congress on Technical and Vocational Education and Training, 5th –6th November 2014, Malaysia. *Procedia - Social and Behavioral Sciences, 204*, 88–97.

Zian, A. & Abd Al-Moneim, F. (2008). Organizational effectiveness of technical colleges in the Kingdom of Saudi Arabia and ways of development in the light of some contemporary trends for the development of technical education and vocational training. *Journal of the Faculty of Education Alzqaziq-Egypt, 58*, 167-224.

The Effects of Computer Assisted Instruction Materials on Approximate Number Skills of Students with Dyscalculia

Asst. Prof. Yılmaz MUTLU
Muş Alparslan Universtiy Education Faculty Mathematics Education Department, Muş
y.mutlu@alparslan.edu.tr

Asst. Prof. Levent AKGÜN
Atatürk University Kazım Karabekir Education Faculty Mathematics Education Department, Erzurum

ABSTRACT
The aim of this study is to examine the effects of computer assisted instruction materials on approximate number skills of students with mathematics learning difficulties. The study was carried out with pretest-posttest quasi experimental method with a single subject. The participants of the study consist of a girl and two boys who attend 3rd grade at elementary school. The contents of the computer-aided instruction materials which have been designed consist of counting skills, place value concepts and addition subjects which are related to mathematics lesson's learning outcomes of 1st and 2nd grades of primary school. With the materials prepared, participants were given 75 lessons of individual instruction during five weeks, each weekdays and approximately 20-30 minutes a day. Dyscalculia screening tool and Panamath program were used as data collection tools. Panamath program calculates test response time, the percentage of accuracy and weber fraction data of participants. In the dot counting and comparison symbolic tests of DST, response time tests and number of correct answers of the participants were calculated, while mean absolute error were calculated in the mental number line tests. The findings of the study indicate that the approximate skills of the participants have developed and there has been significant increase in their speed of answering.

INTRODUCTION

Mathematics is a complex course which includes different domains like arithmetic, arithmetic problem solving, statistics, geometry, algebra, probability, and calculus. This condition means that variety of basic abilities related to sense of quantity, symbolic decoding, memory, visual-spatial capacity, and logics must be mobilized. Students who have difficulties with any of these abilities or in their coordination can experience mathematics learning disability (MLD) (Karagiannakis, Baccaglini-Frank, & Papadatos, 2014).

MLD / Dyscalculia is a term widely used to describe deficits in math skills associated with arithmetic and arithmetic problem solving (Karagiannakis et al., 2014). Such expressions like arithmetic learning disability/ difficulties, calculation disorientation, deficits in mathematics-arithmetic and specific learning disorder in arithmetic are different names used for the difficulties encountered in mathematics. However, MLD can be preferred due to the existence of difficulty and different causes of difficulty (Gersten, Jordan, & Flojo, 2005). In this study dyscalculia and MLD expression were used in place of each other. While Piazza and et all (2010) define MLD as deficits in possessing inabilities for the acquisition of mathematical knowledge and skills, von Aster & Shalev (2007) cite that developmental dyscalculia is a specific learning disability which affects the normal acquisition of mathematical skills and genetic, neurobiological, and epidemiological evidence related to dyscalculia like the other specific learning disabilities indicate that dyscalculia is a brain-based disorder. Kauffman and colleagues (2013) described primary mathematics learning difficulties as heterogeneous disorder resulting from individual deficits at behavioural, cognitive, neuropsychological and neuronal levels.

The Causes of Mathematical Learning Difficulties

Although the reasons for MLD are still not known very well and the discussions are still continuing (Käser et al., 2013; Michaelson, 2007; Olkun, Altun, Cangöz, Gelbal, & Sucuoğlu, 2012), there are some hypotheses put forward and grouped under two titles. One of these hypotheses is the domain-specific deficitd and the other one is domain-general deficitd (Berch & Mazzocco, 2007; Henik, Rubinsten, & Ashkenazi, 2011; Passolunghi & Lanfranchi, 2012; Vanbinst, Ghesquiere, & De Smedt, 2014).

In domain-specific deficit hypothesis, it is asserted that problems occurring in numerical abilities given to the human beings at birth which are also called number sense by Dehaene (2011), number module by Butterworth (2000) and core knowledge of number by Spelke and Kinzler (2007) cause MLD. It is argued that this core knowledge of number consists of two sub-systems (Carey, 2001; Feigenson, Dehaene, & Spelke, 2004). One of

these two sub-systems is approximate number system (ANS) which subserves the estimation of the number of items in a set and the other one is exact number system(Izard, Pica, Spelke, & Dehaene, 2008; Olkun et al., 2012) or object tracking system (OTS) (Karagiannakis et al., 2014) which helps to determine the precise number of numerosities.

Approximate number skill is a skill used to estimate numerical quantities greater than four or when two numerosities are compared, it is used to identify which one is greater or smaller. It was determined that infants could perceive numerosities three hours after they were born (Izard, Sann, Spelke, & Streri, 2009). Moreover, the findings revealed that the differences in unlearned approximate number sense were related to the differences in mathematics achievement (Halberda, Mazzocco, & Feigenson, 2008), and numerical discrimination of individuals with MLD is much more problematic than their peers (Piazza et al., 2010).

Weber fraction is used as a measure for the determination of approximate number system. Weber fraction is a ratio which developed from the performance of two quantities that will be discriminated (Dehaene, 2003; Holden, Francisco, Zhang, Baric, & Tommerdahl, 2011). Figure 1 presents examples of different Weber fraction values. Numerical discrimination / numerical acuity is defined as an ability to discriminate between larger or smaller quantities when comparing them. It was determined that numerical discrimination/numerical acuity developed with increasing age, education and environmental factors (Halberda & Feigenson, 2008). It was reported that before their first birthday, infants' numerical discrimination/numerical acuity developed from the ratio of 1:2 to 2:3 ratio (Lipton & Spelke, 2003). It was found that infants at the age of 3-4 could discriminate numerosities by the ratio of 3/4 (Lipton & Spelke, 2003) and this ratio decreased to a value such as 7/8 in their 20s (Piazza et al., 2010).

Exact number system/object tracking system, one of the components of core knowledge of numbers, enables subitizing which is defined as the ability to 'see' a small amount of objects (maximum 4 objects) and know how many there are without counting, counting, and mental calculation. Kaufmann and colleagues (1949; as cited in (Desoete, Roeyers, & De Clercq, 2004) was defined the ability of subitizing as rapid (40-100 ms/item), accurate, and reliable judgments of numbers performed for small number of items. Clements (1999) states that there are two kinds of subitizing: perceptual and conceptual. Perceptual subitizing is close to the original definition of subitizing and one can state how many without counting or using mathematical operations. For example, Clements (1999) cites that a child without any learned mathematical knowledge can subitize "3 items" perceptually. Similarly, Clements states that conceptual subitizing has an advanced-organizing role in counting. For example, Clements argues that people recognize the eight-dot domino without counting it because they see it as a composite of parts and as a whole. They see the eight-dot domino as composed of two groups of four and as one eight.

Young children use perceptual subitizig to build their initial ideas of counting and cardinality (Celements, 1999). From this aspect, it can be stated that perceptual subitizing is thought to be the basis for conceptual subitizing. Thus, Olkun and Özdem (2015) found that conceptual subitizing implementations increased calculation performance of students with low math performance. In addition to this, it was stated that individuals with MLD were slower in subitizing tasks and showed deficits in subitizing, in comparison to their peers(Landerl, Bevan, & Butterworth, 2004).

The findings obtained on cognitive functions which affect mathematics performance like intelligence, language skills, working memory, executive functions, attentional control, semantic memory, and data processing speed revealed domain-general cognitive deficit hypothesis (Andersson & Östergren, 2012; Östergren, 2013). This hypothesis argues that the vulnerabilities in one or more cognitive functions given above cause mathematical learning disability.

Despite many studies conducted about the hypotheses put forward for the reasons for MLD, very few things are still known about which domains of mathematical cognition affect each other, which ones function together or alone and how these domains affect learning (Fuchs et al., 2010).

Computer-assisted instruction of students with MLD

With the developments in technology and research carried out in special education, the researchers who want to make contribution to the learning abilities of students with MLD went through the effort of using technology within the framework of mathematics curriculum. (Amiripour, Bijan-zadeh, Pezeshki, and Najafi, 2010). Maccini, Gagnon and Hughes (2002) state that technology-based interventions hold great promise for the educational development and growth of students with MLD and today technology has become a very important tool with lots of potentials helping students with MLD than ever before. Virtual environment provides an

opportunity for students to connect their opinions, emotions, and actions and also makes contributions to students' motivation for learning and cognitive development (de Castro, Bissaco, Panccioni, Rodrigues, & Domingues, 2014).

The research studies carried out on the improvement of elementary school mathematics point out that computer-based training of number sense (processing magnitudes or locating numbers on the number line) and training of domain-general cognitive abilities (working memory) can promote mathematics achievement (Kuhn & Holling, 2014).

Many studies carried about students with MLD reveal that instructional games and activities and computer-assisted instruction promote these students' math performance and develop positive attitudes towards mathematics (de Castro et al., 2014; Desoete & Praet, 2013; Räsänen, Salminen, Wilson, Aunio, & Dehaene, 2009; Wilson, Revkin, Cohen, Cohen, & Dehaene, 2006).

This study seeks answers to the problem "what are the effects of computer-assisted instruction materials on approximate number skills of primary school 3rd grade students with dyscalculia?"

METHOD

Research Design

One group pre-test post-test research design was selected to measure the effect of CAI stated in the problem statement of this study on the achievement of students with MLD. Single subject research model is a quasi-experimental research design which interprets the findings related to one or a few subjects (McLaughlin and Mertens, 2004; Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2012). Because the subjects are not chosen via randomly, single subject studies are accepted as quasi-experimental.

Participants

The study group of the research consists of 3 students with MLD, 1 female and 2 males, going to two different elementary schools in Muş in 2015-2016 education year. The participants were chosen via multiple filtering design. In this model, teacher views, dyscalculia pre-assessment test, dyscalculia screening tool, student diagnostic form, and intelligence test were used as a filter.

M1. He is nine years and nine months old and he looks calm and quiet. However, when he comes together with his friends, he can be considered as one of the naughtiest children in school. He likes talking about his friends and events in his neighbourhood very much. He has got one sister and two brothers. He lives with his parents and siblings in a rented house. There are two rooms in the house and their house is heated with a stove. His father works a minimum wage job and his mother is a housewife. M1 did not receive pre-school education. He continued his education in the same school and considering attendance, he did not play truant (total one month or more than a month) for a long time according to the school records. The data obtained from the interviews and observations carried out with him and his family reveal that M1 is normal in every aspect regarding health. M1 does not have any problems with hearing and seeing and he did not have an illness which would affect him for a long time.

F1. F1 is nine years and five months old. She looks older than her peers and she is social and friendly. She lives in their own house with her parents and two sisters aged 12 and 14. Their house is heated with a stove and she does not have a room of her own. Her father is a chef in a restaurant and her mother is a housewife. F1 did not receive pre-school education and when she was in the second grade, she changed her school and went to another school located in the same city. Considering attendance, she did not play truant (total one month or more than a month) for a long time. F1 does not have any problems with hearing and seeing. Moreover, she did not have any diseases that affected her for a long time. The data obtained from the interviews and observations carried out with her and her family reveal that she is normal in every aspect regarding health.

M2. He is nine years and two months old. He can be identified as someone who keeps aloof from his friends and he is reserved. He loves spending time with his tablet. He reflects his interest in computers and computer games in his daily life talks. M2 is the youngest of his three siblings and he is the only son of his family. His father is a high school graduate and his mother is a primary school graduate. His father works as a construction foreman and his mother is a housewife. M2 lives with his parents and three sisters aged 14, 18, and 19 in their own house. M2 shares his room with his elder sister. The family state that they do not have financial difficulties. Because M2 is the youngest and the only son in the family, he is the family's favourite. His father states that when compared to their other children, they take care of him more and his elder sisters constantly help him with his lessons so that he can be successful. His father stated that although his son was successful in reading and

writing, he was not successful in mathematics and added that he could not understand why he was unsuccessful in mathematics. The school records document that M2 did not receive pre-school education and he did not play truant when participating in his lessons (total one month and more than a month). However, M2 was exposed to teacher change during his three year education. M2 does not have any problems with hearing and seeing and also he did not have any diseases that affected him for a long time. The data obtained from the interviews and observations carried out with him and his family reveal that he is normal in every aspect considering health.

Data Collection Tools

Panamath. As seen in Figure 1, Panamath program (Halberda, Mazzocco and Feigenson, 2008) involves tasks comparing whether there are more blue dots or yellow dots in flash. With these tasks students' response time for approximate number system is measured over the variables of accuracy of their basic gut sense for numbers and Weber fraction. The number of tasks assigned change according to the determined time and the difficulty level of tasks change considering the age. Throughout the research, it was determined that the total time for Panamath test was 5 minutes. An individual's average scores obtained in this test is compared to the group average scores (below10% and above 90%) obtained from their peers.

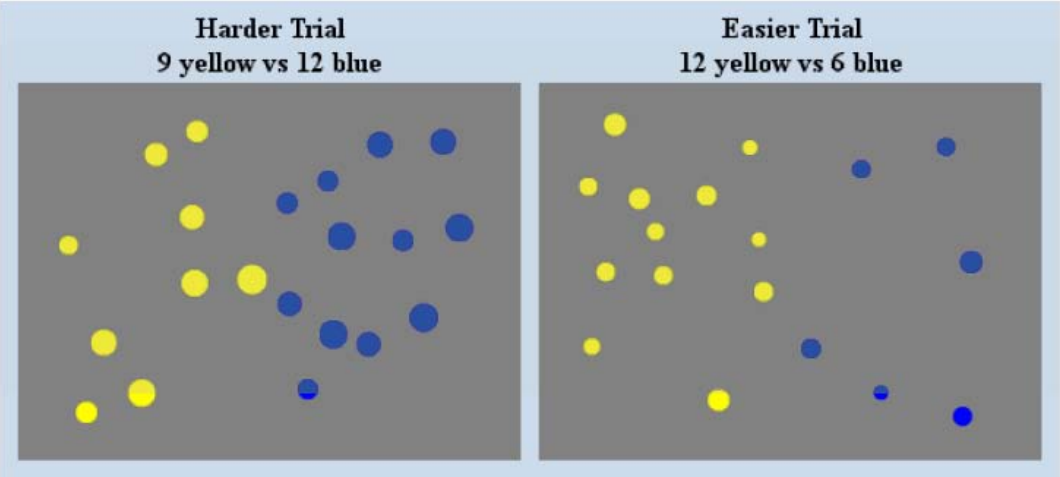


Figure 1. Panamath item examples (Halberda, Mazzocco and Feigenson, 2008)

Dyscalculia screening tool (DST). Mental Number Line Test, one of the sub-tests of DST developed within a research project funded by Scientific and Technological Research council of Turkey (TUBITAK No: 111K54 by Olkun and colleagues (2012) was used. The mean absolute error for the data obtained from the mental number line estimation was calculated. The absolute value was taken for the response given by the individuals for each item and the difference for the accurate response belonging to that item.

For the reliability analysis of Mental Number Line Estimation, the data were collected from total 261 3rd grade elementary school students (130 males and 131 females) chosen randomly from the five elementary schools located in Muş. The elementary school teachers were asked whether there was an inclusive student among the students chosen. In case there were inclusive students, they were excluded from the group; however, their test results were not used. The cronbach alpha values of the tests given in Table 1 were ,72 - ,85 - ,87, respectively.

Table 1:DST Tests' Reliability Measurements

	Madde Sayısı	**Cronbach Alpha**
MNL-1	9	,72
MNL-2	24	,85
MNL-3	25	,87

The content and functions of Mental Number Line (MNL), one of the sub-tests of DST were given below.

Mental Number Line: In this test the individuals are asked to indicate the position of numbers on number lines between the range of 0-10, 0-100, and 0-1000 approximately and the number lines are on the tablets and a line

which could be manipulated appears on the number line when clicked. The position of total 58 numbers, 9 numbers within the range of 0-10, 24 numbers within the range of 0-100, and 25 numbers within the range of 1-1000 are estimated.

Data Analysis

The data were collected via Panamath, DST, and achievement tests. Panamath generates two output files after the test: a pdf file for the user and an excel file. The "Summary" section of the XLS file where the data were summarized contains response time data calculated for an individual, percent accuracy, and Weber fractions. DST does not present final data as is generated by Panamath. Thus, personal information stored on the tablets was organized in an XLS file by the researcher. Mean absolute error was calculated in Mental Number Line tests.

Implementation Process

Dyscalculia Pre-Assessment Test used for identifying the participants was also administered to assess the participants' mathematics levels. When the students' forms were examined, it was found that these students had problems with adding two one digit numbers and answering questions about place value concepts like ones and tens. Because of that, the materials were developed considering the 1st and 2nd grade mathematics course learning outcomes. In computer assisted instruction materials, first counting skills, concept of place value, and addition was taught respectively at 1st grade level and then at the 2nd grade level counting skills, concept of place value, and addition were taught. The implementation was carried out in a primary school located in a city in the east of Turkey. The study lasted five weeks, five days a week and between 20 and 30 minutes on average and the computer assisted instruction was given individually. The Materials was completed with a three-month study. Before the implementation started, materials were evaluated by the experts and testing study was conducted. The content was composed by the researchers and expert support was received for its design.

The program consisted of three sections: material home page, (home page) and the related content page or pages. After pushing the enter key, students will see the menu bar. The menu page includes the following subjects: Under the main heading "Mathematics Begins with Counting" designed for counting skills are "Hundred Cards, Which one has got more? And Going for Hundred", under the main heading "Numbers Increase Digit by Digit" developed for teaching digit concept are " Make it tens!, Numbers with Cubes", and considering the addition, under the main heading "Let's Get Together and Increase" is " How many? What is the carried value? All the activities in the materials were dubbed. Moreover, with starting of the material, background music specially prepared plays. Home page and menu page screen shot belonging to the materials are given below:

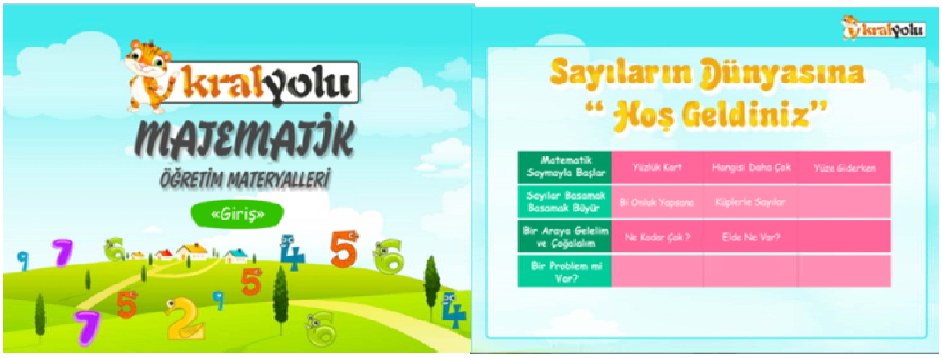


Figure 2. Course materials' home page and menu page screen shot

The implementation was carried out in six sessions. The first three sessions were about 1st grade mathematics course objectives and the last three sessions included 2nd grade mathematics course objectives. The sessions were explained in detail below.

***1st* Session.** In this sessions the following 1st grade mathematics course objectives "The student identifies the number of items in a group which has less than 10 items and writes out the number in words (letters)/ using figures "and "The student matches the items one-to-one included in two groups less than 10 and compares the number of items in the groups" were considered and a four-day training was held with the materials designed. While developing the material," such neuroscientific findings as triple coding, approximate number skill, exact number skill, distance effect, distance/ size effect, and working memory were benefited from. In the session, key concepts like "more, less, and matching" were included. In the material "Which one has got more?" developed for counting skills, firstly, points in different colours are counted. Then, the number of the points is written out

in words (letters) and using figures and the answers are controlled. If the answer is wrong, the window opens and the statement "Wrong answer, please try again" occurs vocally. When the student answers the question correctly, he moves on to the next window and he is asked to count the points in another colour. After this step, he is asked which points in different colours are many or few. The points occur on the screen for two seconds and then disappear. The question is answered by clicking on the colourful buttons appearing on the screen consecutively. There are total 12 activities in the material which involve the process explained. In the first six activities, the question "Which one has got more?" is asked and in the last six activities the question "which one has fewer" is asked. The screen shot of the material called "Which one has got more?" is presented below.

Figure 3. "The screen shot of the material called "Which one has got more?

2nd Session. In this sessions the following 1st grade mathematics course objectives "the student shows a group of quantity of items between 10 and 20 by separating them into ones and tens, he writes out the number in figures and reads it which corresponds to these items" were considered and a four-day training was given with the materials designed. While preparing the material," such neuroscientific findings as triple coding, approximate number skill, and working memory were used. In the sessions such key concepts as "ones, tens, units digit, tens digit were included. In the course material "Make it Tens" developed for place value, students are asked to write out the number of the different items between 10 and 20 in letters and figures. When the student answers it correctly, a new window opens and the student is asked to drag the items into the ones and tens boxes and leave them there. When this process finishes, the student pushes the continue button and another section in which he can enter the number of the ones and tens. When the student enters it correctly or wrongly, an animated window opens and gives explanation about the process. There are total 10 activities which are independent of each other. The screen shot of the material called "Make it Tens" was given below.

Figure 4. "The screen shot of the material called "Make it Tens"

3rd Session. In this session considering the 1st grade mathematics course objectives "the student finds the sum of two natural numbers whose sum is 10, writes it as a mathematical statement and shows it with a model" and "the student finds the sum of two natural numbers whose sum is between 10 and 20, writes it as a mathematical statement and shows it with a model", a four-day training was given with the materials designed. While preparing the material," such neuroscientific findings as triple coding, number disorientation, and working memory were used. A candy making machine was designed in the material called "How many?" intended for addition. When the candy making machine is clicked, the machine sways back and forth with a sound typical of machines and makes candies for the first bowl in designated numbers. While the candies fall into the bowl, the number of the candies appears in letters and figures just below the bowl. After this operation, the machine moves on to the second bowl automatically and when it is clicked, it produces candies and disappears. In addition to this, the student is asked how many candies the candy making machine has made. The student enters the result in letters and figures. If the answer is true or false, a new window opens and the next activity continues. The screen shot of the material called "How many?" was given below.

Figure 5. "The screen shot of the material called "How many?"

4th Session. This session was designed considering the 2nd grade mathematics course objectives "the student compares two natural numbers less than 100 and determines the relationship between them", "the student lines up three numbers less than 100 from smaller to bigger or bigger to smaller ", "the student lines up four numbers less than 100 from smaller to bigger or bigger to smaller" and a four-day training was given with these teaching materials developed according to these objectives. While preparing the material, such neuroscientific findings as triple coding, approximate number skill, number disorientation, and working memory were utilized. In the session, key concepts like "bigger, smaller, the biggest, the smallest were included. The teaching material called "Going for Hundred" consisting of two parts was developed for counting skills at the 2nd grade level. In the "Line up the Numbers" section, the students are asked to line up the numbers containing 10 items. In "Smaller? Bigger?" section, the students are asked to line up two numbers in four items, three numbers in four items, and four numbers in the remaining four items from smaller to bigger or bigger to smaller. When the check answer buttons are pressed, the numbers are seen in-line on a ruler. It draws attention that on each check answer page there are smaller and bigger symbols and ranking of numbers on the number line. The screen shot of the material called "Going for Hundred" was given below.

Figure 6. "The screen shot of the material called "Going for Hundred"

5th Session. In this session, a four-day training was offered with the teaching material which was developed considering the 2nd grade mathematics course objectives "the student separates a quantity with less than 100 items into a set of ones and tens and writes and reads the number which correspond to them" and " he names the digits of the natural numbers less than 100 and identifies the digit value of the numbers". While developing the material, such neuroscientific findings as triple coding and working memory were utilized. The key concepts such as "tens, ones, tens digit, units digit" were used. The student pushes the generate number button and the numbers smaller than a hundred appears on the screen randomly with the material "Numbers with Cubes" designed to teach place value concepts. The student is asked to use the units and tens digits of the number and ones and tens blocks. For the ones block he clicks the ones button and if enough numbers are exceeded, it is deleted with an eraser and the operation can be repeated. The same thing can be done with tens blocks. As the buttons are clicked, the numbers appear on the screen both as in letters and figures and they are also dubbed. The screen shot of the material called "Numbers with Cubes" was given below.

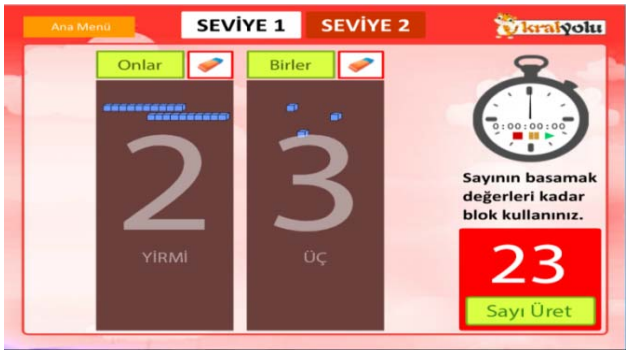


Figure 7. The screen shot of the material called "Numbers with Cubes"

6th session. In this session, a five-day training was given for the teaching material developed according to the primary school 2nd grade mathematics course objectives "the student does the addition of natural numbers without carrying (regrouping)" and including regrouping whose sums are 100 and he explains what regrouping means in addition with models". While developing the material, such neuroscientific findings as triple coding and working memory were utilized. The key concepts like addend, sum, and regrouping (carrying or borrowing)" were included. As shown in Figure 7 prepared for teaching of addition at the 2nd grade level, there are two generate number buttons in this material. The numbers are generated randomly. First of all, because addition without regrouping will be performed, suitable numbers are generated with generate number buttons. Considering the figures of the number in the units digit and tens digit, the student is asked to click the (+) and (-) buttons in each section and add ones and tens blocks. The operation is performed firstly with blocks. But, if addition with regrouping is performed, regrouping button is also used. The sum is written and "check the answer" button is clicked. The screen shot of the material called "What is the carried value" was given below.

Figure 8. The screen shot of the material called "What is the carried value"

FINDINGS

The findings obtained in this section via DST, Panamath software, and achievement tests were included considering the sub-problems of the study. The findings belonging to the participants were interpreted within the context of each problem.

Findings Related to the Approximate Number Sense of Students with MLD

In this section within the context of the sub-problem "What are the effects of computer assisted instruction materials on approximate number representations (sense) of students with MLD?", the findings obtained from the Mental Number Line Estimation, one of the sub-tests of Panamath and DST, were included. The test results of F1, M1 and M2 were given, respectively.

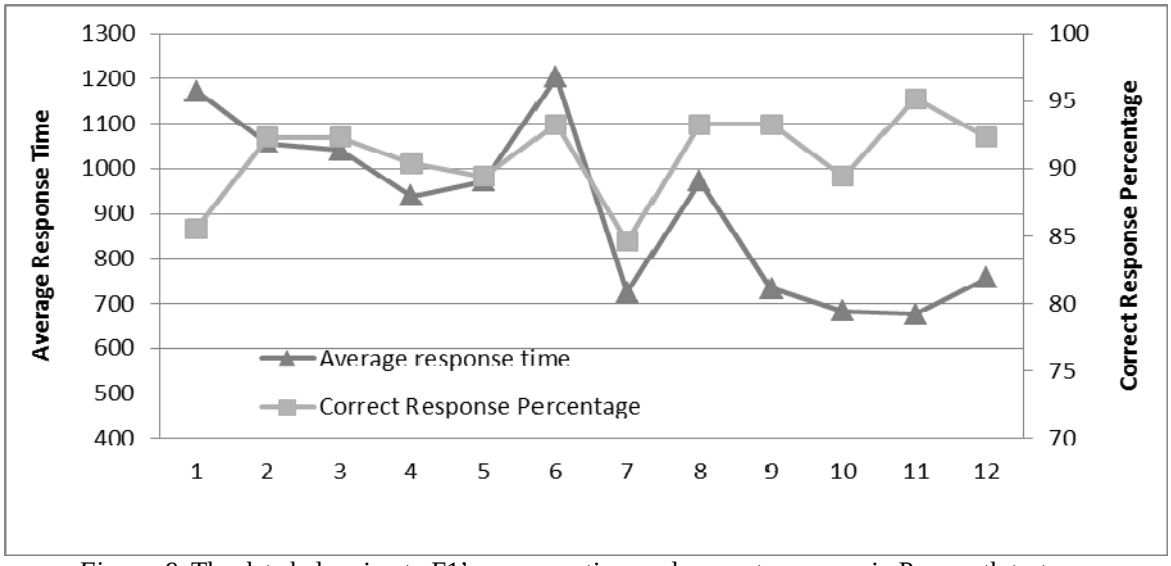


Figure 9. The data belonging to F1's response time and percent accuracy in Panamath test

When Figure 9 is analysed, the data belonging to K1's mean correct response time and percent accuracy obtained from 12 tests in the Panamath software are viewed. F1's lowest percent accuracy is 85 % with the 7th test and the highest percent accuracy is 95% with the 11th test. F1's mean accuracy is 91%. When test results are examined, it can be stated that percent accuracy has gradually increased.

F1's highest test with mean correct response time for each item is the 2nd test (1203ms) but the 11th test has the lowest mean response time as 677ms. F1's mean response time for 12 tests is 991 ms. When considered correlating it with the correct responses, it is viewed that there was a decrease with F1's response time. Considering the Panamath data, while the mean response time for below 10% of nine-year old children is 1630 ms, above 90% of students' mean response time is 1004. According to the Panamath data, F1's mean response time is below that of 90% of the group's mean response time.

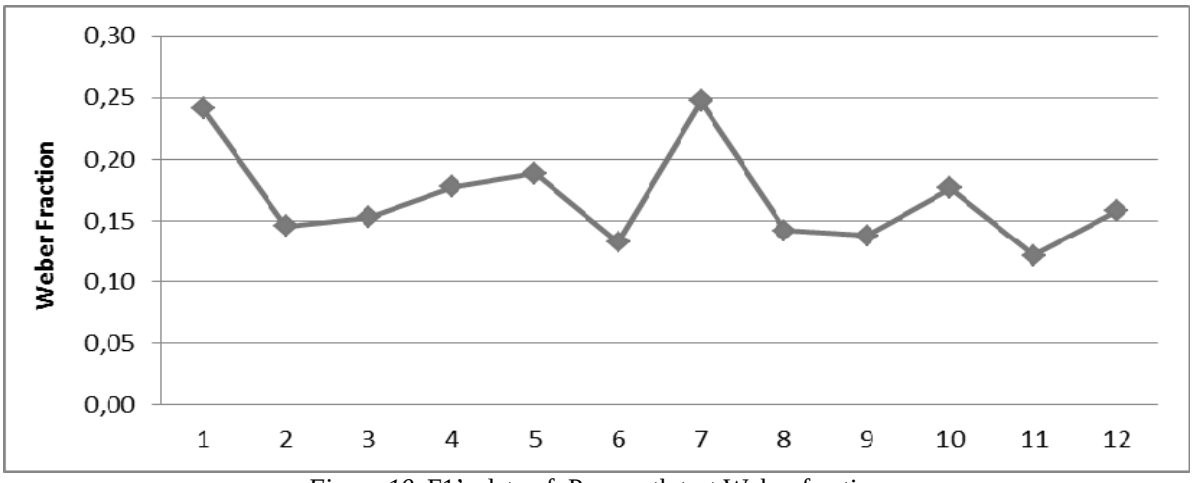


Figure 10. F1's data of Panamath test Weber fraction

When Figure 10 is analyzed, 12 Weber fractions belonging to F1 in the Panamath software is are presented. F1 got the highest Weber fraction value (0.25) in the 7th test and the lowest Weber fraction value (0,12) in the 11th test. F1's mean Weber fraction is 0,17 in 12 tests. It can be stated that when F1's tests were compared, the values for the Weber fraction generally decreased,thus the acuity of number sense increased and the training had a positive effect on F1. The values F1 got regarding the Weber fraction can be compared to the 9-year-old children's mean scores. While the mean Weber fraction for the group below 10% is 0,48, the mean Weber fraction for the group above 90% is 0,18. It was determined that F1's mean Weber fraction was below that of the group above 90%.

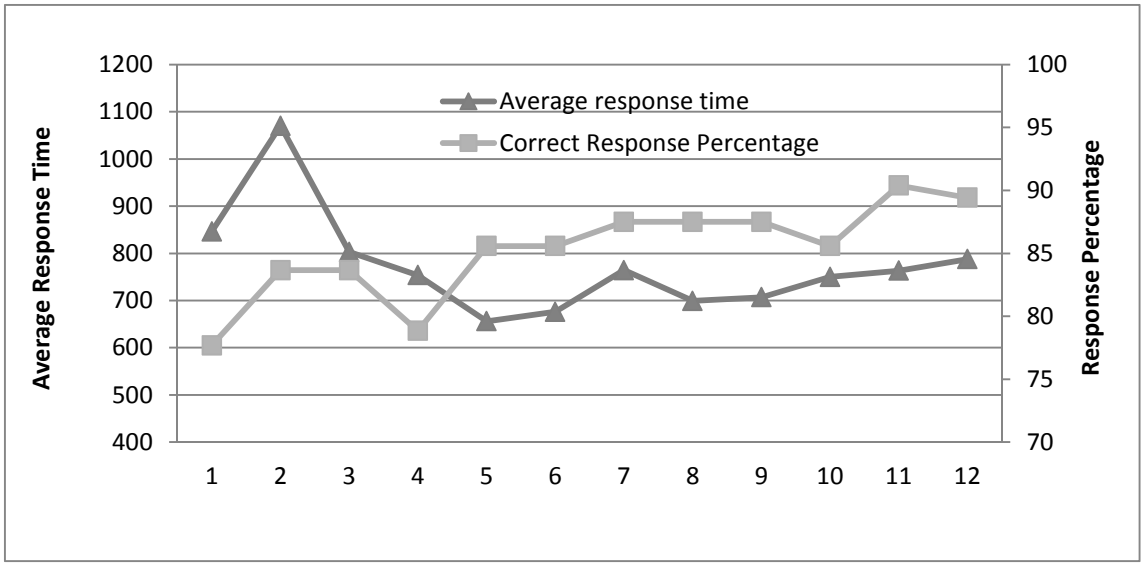


Figure 11. The data belonging to M1's response time and percent accuracy in Panamath test

When Figure 11 is examined, the data belonging to M1's response time percentages and percent accuracy obtained from 12 tests in the Panamath software are viewed. M1's lowest percent accuracy is 78 % with the 1st test and the highest percent accuracy is 90% obtained from the 11th test. It can be stated that percent accuracy has increased gradually. M1's mean accuracy for the 12 tests is 85%.

E1's highest test with mean response time for each item in the Panamath test is the 2nd test (1203ms) but the 5th test has the lowest mean response time as 677ms. M1's mean response time for 12 tests is 773 ms. When considered correlating it with the correct responses, it is viewed that there was a decrease with M1's response time. Regarding the Panamath data, while the mean response time for below 10% of nine-year old children is 1630 ms, above 90% of students' mean response time is 1004. The Panamath data reveals that M1's mean response time is lower than that of above 90% of the group's mean response time.

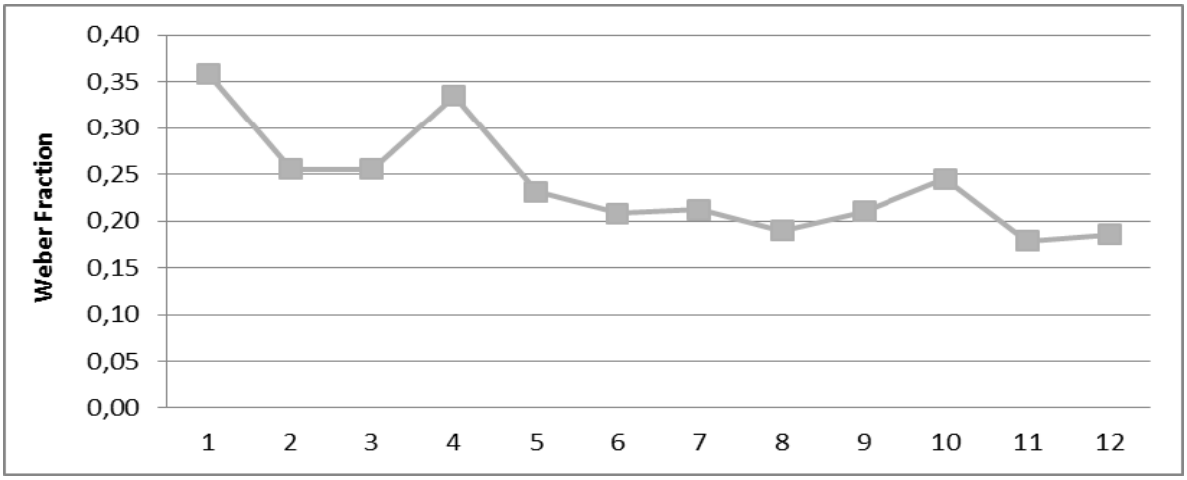


Figure 12. M1's data belonging to Panamath test Weber fraction

Figure 12 presents the values of 12 tests for Weber fraction obtained from the Panamath software and belonging to M1. M1 got the highest Weber fraction value (0.36) in the 1st test and the lowest Weber fraction value (0,18) in the 11th test. E1's mean Weber fraction is 0,24 in 12 tests. It can be stated that when M1's tests were compared, the values for the Weber fraction generally decreased thus the acuity of number sense increased and the training had a positive effect on M1. The values M1 got regarding the Weber fraction can be compared to the 9-year-old children's mean scores in the Panamath software application. While the mean Weber fraction for the group below 10% is 0,48, the mean Weber fraction for the group above 90% is 0,18 in the Panamath software. It was determined that M1's mean Weber fraction was below that of the group above 10% and close to the mean Weber fraction of the group above 90%.

Figure 13. The data belonging to M2's response time and percent accuracy in Panamath test

When Figure 15 is examined, the data belonging to M2's response time percentages and percent accuracy obtained from 12 tests in the Panamath software are considered. M2's lowest percent accuracy is 88 % with the 1st,3rd, 5th and 6th tests and the highest percent accuracy is 95% in the 7th test. It can be stated that percent accuracy has increased in general. M2's mean accuracy for the 12 tests is 90%.

M2's highest test with mean response time for each item in the Panamath test is the 1st test (956) but the 5th test has the lowest mean response time as 485 ms. M2's mean response time for 12 tests is 594 ms. When considered correlating it with the correct responses, it is viewed that M2's response time decreased. Regarding the Panamath data, while the mean response time for below 10% of nine-year old children is 1630 ms, above 90% of students' mean response time is 1004. In comparison to the Panamath data, it is found that M2's mean response time is much lower than that of above 90% of the group's mean response time.

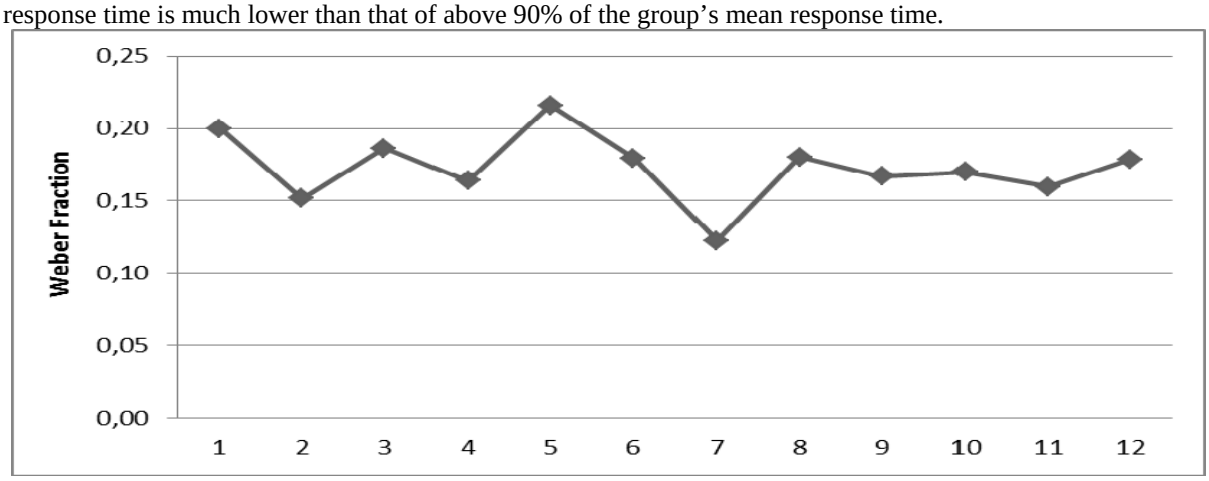


Figure 14. M2's data belonging to Panamath test Weber fraction

Considering Figure 14, 12 test values for Weber fraction obtained from the Panamath software and belonging to M2 are presented. M2 got the highest Weber fraction value (0.22) in the 5th test and the lowest Weber fraction value (0,12) in the 7th test. M2's mean Weber fraction is 0,17 in 12 tests. It can be stated that when M2's tests were compared, the values for the Weber fraction constantly decreased, thus the acuity of number sense increased and the training had a positive effect on M2. The values M2 got regarding the Weber fraction can be compared to the 9-year-old children's mean scores in the Panamath software. While the mean Weber fraction for the group below 10% is 0,48, the mean Weber fraction for the group above 90% is 0,18 in the Panamath software. It was determined that M2's mean Weber fraction was below that of the group above 90%.

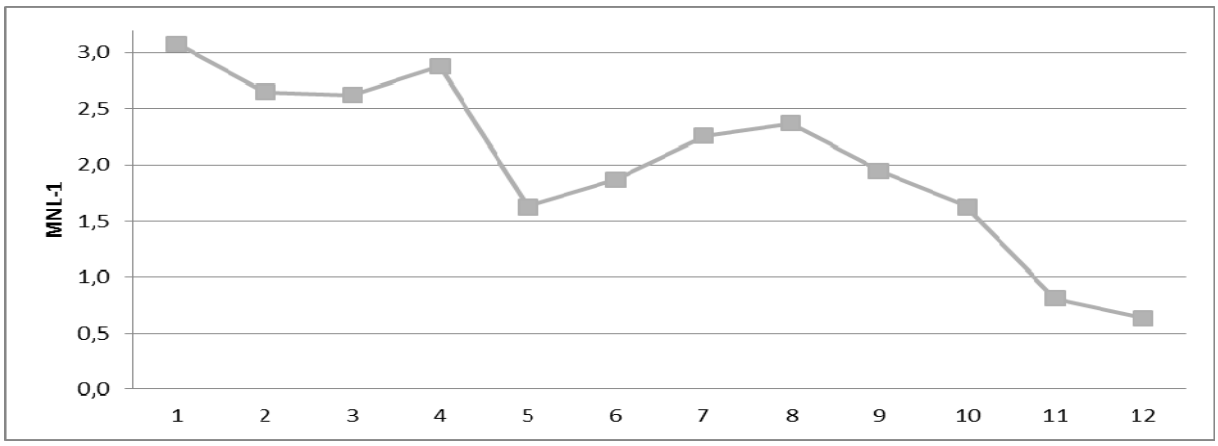


Figure 15. F1's data for mental number line estimation (0-10)

Figure 15 presents F1's mean inaccurate estimates in MNL-1 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-10. While F1 made the most inaccurate estimates with 3.1 in the 1st test, she made the fewest inaccurate estimates with 0,6 in the 12th test. The average for mean inaccurate estimates of F1 in 12 tests is 2,3. F1's MNL-1 test results reveal that the computer-assisted instruction increased F1's performance in estimating the position of number on the number line between the ranges of 0-10.

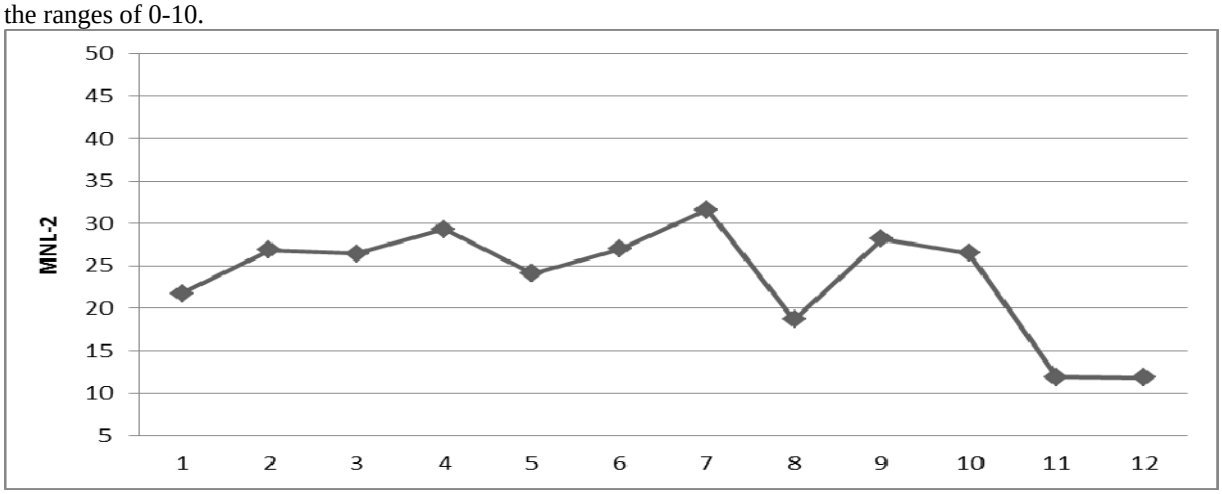


Figure 16. F1's data for mental number line estimation (0-100)

In Figure 16, F1's mean inaccurate estimates in MNL-2 test, one of the sub-tests of DST and including the task of indicating the position of numbers on the number line between the ranges of 0-100 are given. While F1 made the most inaccurate estimates with 31.6 in the 7th test, she made the fewest inaccurate estimates with 11.9 in the 11th and 12th tests. The average for mean inaccurate estimates of F1 in 12 tests is 23.68. F1's MNL-2 test results reveal that the computer-assisted instruction increased F1's performance in estimating the position of number on the number line between the ranges of 0-100.

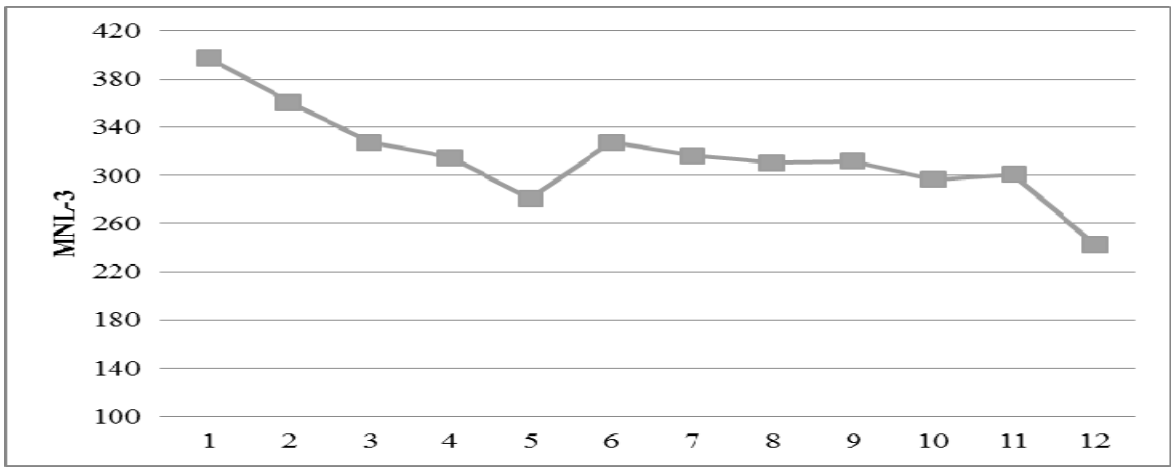


Figure 17. F1's data for mental number line estimation (0-1000)

Figure 17 presents F1's mean inaccurate estimates in MNL-3 test, one of the sub-tests of DST and including the task of indicating the position of numbers on the number line between the ranges of 0-1000.While F1 made the most inaccurate estimates with 398 in the 1st test, she made the fewest inaccurate estimates with 243 in the 12th test. The average for mean inaccurate estimates of F1 in 12 tests is 315. F1's MNL-2 test results reveal that the computer-assisted instruction increased F1's performance in estimating the position of number on the number line between the ranges of 0-1000.

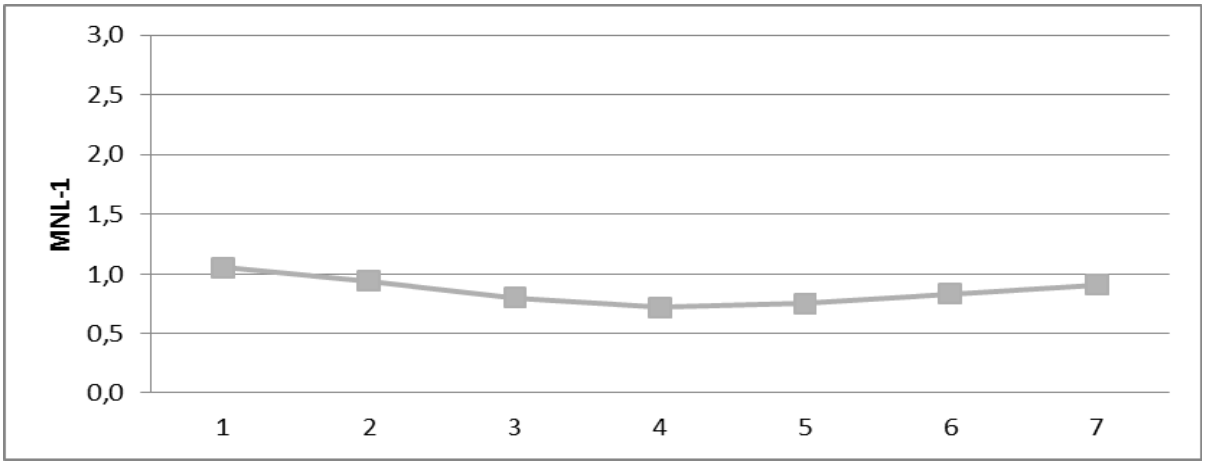


Figure 18. M1's data for mental number line estimation (0-10)

Figure 18 presents E1's mean inaccurate estimates in MNL –1 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-10. M1 made the most inaccurate estimates with 1.2 in the 11th and 9th tests but he made the fewest inaccurate estimates with 0,7 in the 4th and 11th tests. The average for mean inaccurate estimates of M1 in 12 tests is 0.9. It can be stated from M1's MNL-1 test results that the computer-assisted instruction promoted M1's performance in estimating the position of number on the number line between the ranges of 0-10.

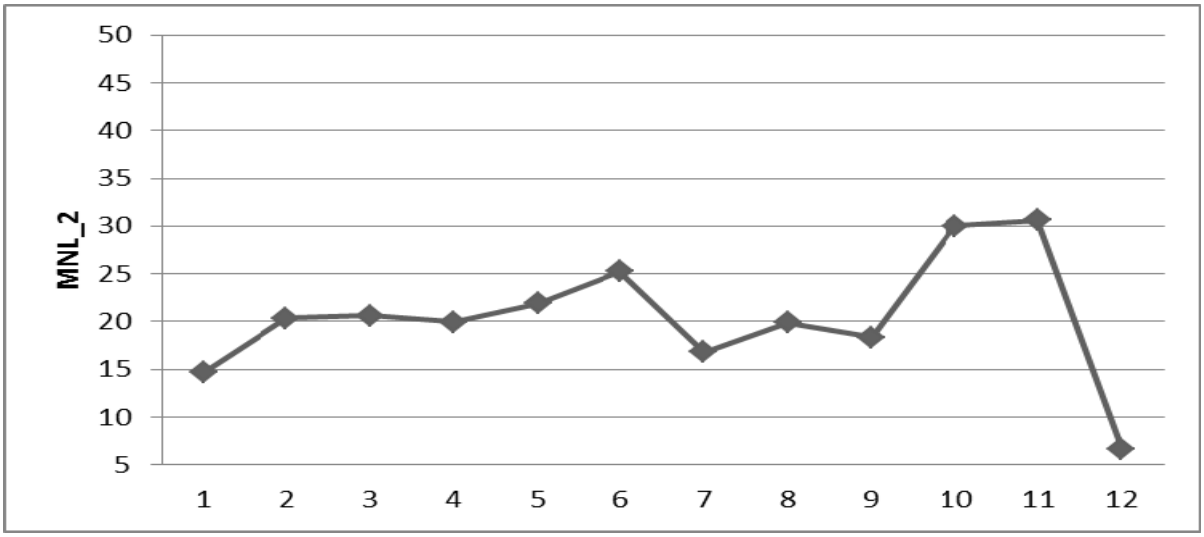


Figure 19. M1's data for mental number line estimation (0-100)

Figure 19 presents M1's mean inaccurate estimates in MNL –2 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-100. The highest mean inaccurate estimates M1 made were30.6 in the 11th test and the lowest mean inaccurate estimates he made were 6.7 in the 12th test. The average for mean inaccurate estimates of M1 in 12 tests is 20.4.

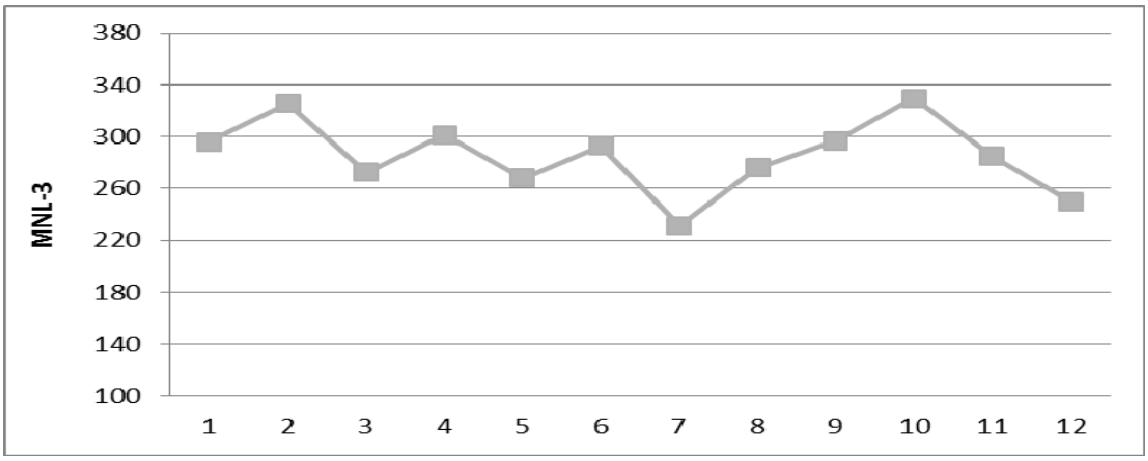


Figure 20. M1's data for mental number line estimation (0-1000)

Figure 20 presents E1's mean inaccurate estimates in MNL –3 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-1000. The highest mean inaccurate estimates M1 made were 330 in the 10th test and the lowest mean inaccurate estimates he made were 231 in the 7th test. The average for mean inaccurate estimates of M1 in 12 tests is 285.4.

It can be stated from M1's MNL-3 test results that the computer-assisted instruction increased M1's achievement in estimating the position of number on the number line between the ranges of 0-1000.

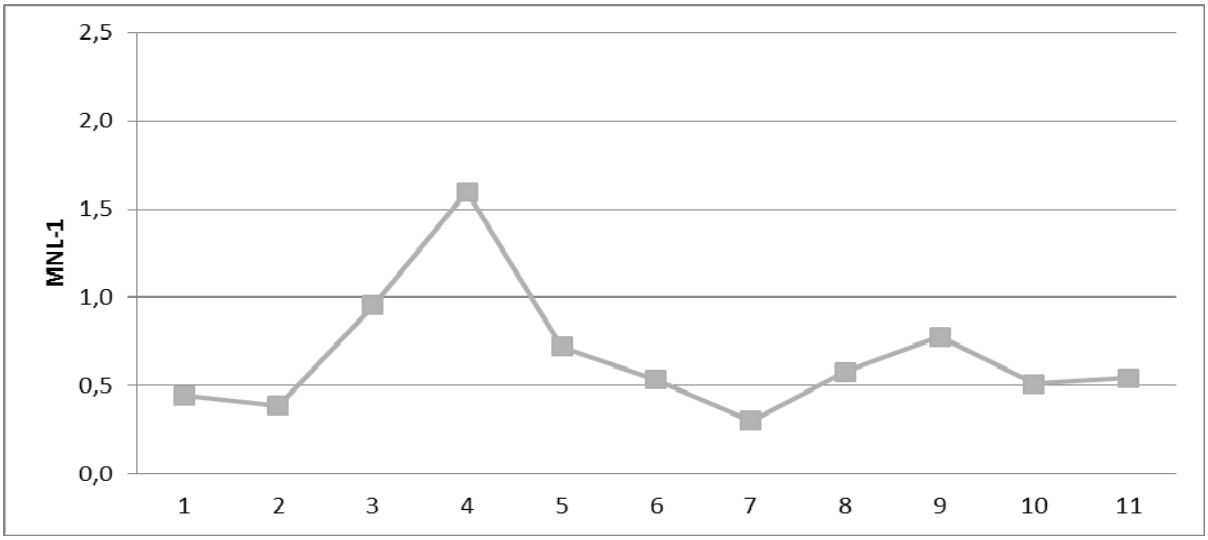


Figure 21. M2's data for mental number line estimation (0-10)

Figure 21 presents M2's mean inaccurate estimates in MNL –1 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-10. The highest mean inaccurate estimates M2 made were 1.6 in the 5th test and the lowest mean inaccurate estimates he made were 0.3 in the 1st and 8th tests. The average for mean inaccurate estimates of M2 in 12 tests is 0.64.

In addition to abnormal test results of M2, mean test scores demonstrate that there was not an increase in M2's performance.

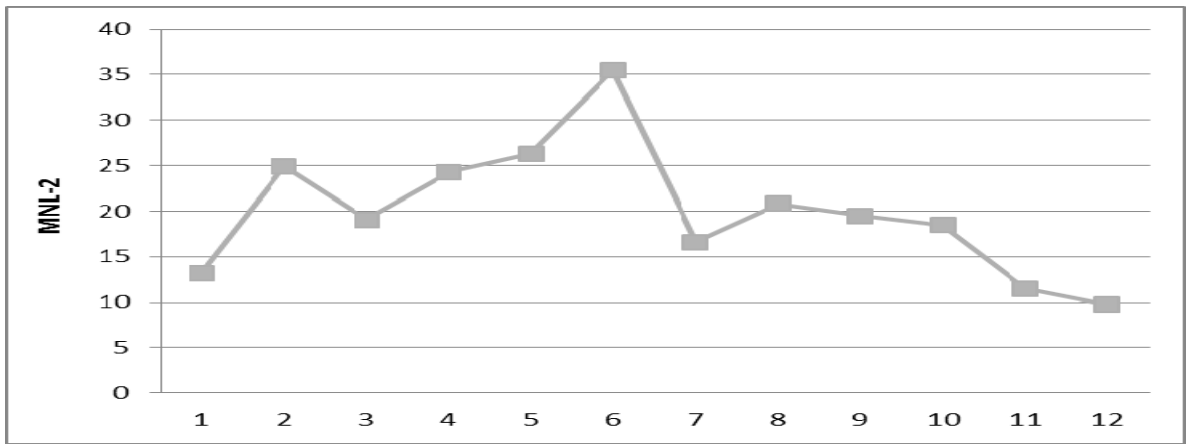


Figure 22. M2's data for mental number line estimation (0-100)

Figure 22 presents M2's mean inaccurate estimates in MNL –2 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-100. The highest mean inaccurate estimates M2 made were 35.3 in the 6th test and the lowest mean inaccurate estimates he made were 9.7 in the 12th test. The average for mean inaccurate estimates of M2 in 12 tests is 20.

It can be stated from M2's MNL-2 test results that the computer-assisted instruction increased M2's achievement in estimating the position of number on the number line between the ranges of 0-100.

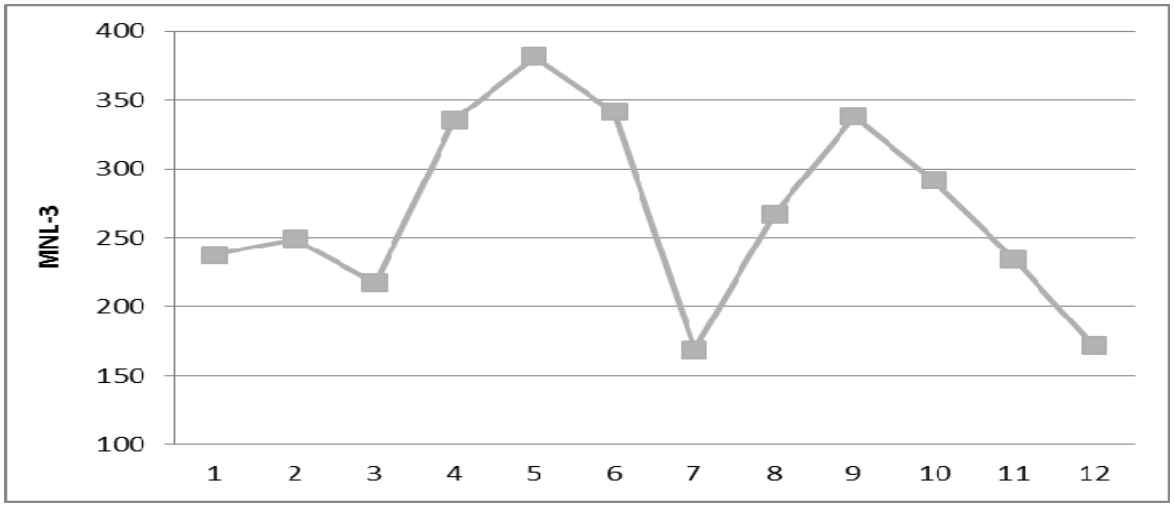


Figure 23. M2's data for mental number line estimation (0-1000)

Figure 23 presents M2's mean inaccurate estimates in MNL –3 test, one of the sub-tests of DST and including the task of locating the position of numbers on number line between the ranges of 0-1000. The highest mean inaccurate estimates M2 made were 381 in the 5th test and the lowest mean inaccurate estimates he made were 169 in the 7th test. The average for mean inaccurate estimates of M2 in 12 tests is 269.25.

It can be stated from M2's MNL-2 test results that the computer-assisted instruction increased M2's achievement in estimating the position of number on the number line between the ranges of 0-100. In addition to abnormal test results of M2, it is observed that M2 got scores below the beginner level in some tests.

CONCLUSION, DISCUSSION, AND SUGGESTIONS

This study examined the effect of computer assisted instruction materials on the number sense abilities of one female and two male students with MLD determined via using multiple filtering design. The study was carried out via single subject pre-test post-test, quasi-experimental research design.

The data about number sense acuity were gathered via Panamath test and Mental number Line (MNL) test, one of the sub-tests of DST. The Panamath data of the participants reveal that participants' Weber fraction values decreased and MNL test results exhibit that their mean absolute error decreased, therefore, their number sense acuity increased. Similarly, the findings related to exact number sense reveal that the speed of students with MLD increased in the dot counting and number comparison tests. This condition supports that computer assisted individualized instruction has a positive effect on students' number sense acuity.

Many studies reveal that approximate number system is not independent of educational and cultural inventions (Gordon, 2004; Halberda ve Feigenson, 2008; Nys, Ventura, Fernandes, Querido, & Leybaert, 2013). Thus, Obersteiner, Reiss, and Ufer (2013) in their study examined the effect of training intended for enhancing first grade students' basic number processing and arithmetic skills on their approximate mental number skills. It was reported in the study that performance of the students with MLD improved with tasks related to the exact or approximate number sense. The improved number sense acuity of students with MLD enables them to perform arithmetic operations much more easily (Kucian et al., 2011; Obersteiner et al., 2013).

It was determined that the differences in unlearned approximate number sense was associated with the differences in math achievement (Halberda et al., 2008) and the numerical acuity of individuals with MLD was further problematic in comparison to their peers (Piazza et al., 2010) . Within this context, considering the findings obtained about approximate number sense and the literature, it can be stated that the activities consisting of comparing non-symbolic mumerosities in math courses in pre-school and in the first years of schooling, estimating numbers on a number line, and the distance effect in number comparison (eg: is number 5 numerically close to 8 or 3?) have a considerable potential to increase the performance of students with MLD. Moreover, the reflections of activities developed for approximate number abilities can be examined in the long term and via more groups participating in training.

REFERENCES

Amiripour, P., Bijan-zadeh, M., Pezeshki, P., ve Najafi, M. (2010). Effects of assistive technology instruction on increasing motivation and capacity of mathematical problem solving in dyscalculia student. *International Research Journals, 2*(10), 1611-1618.

Andersson, U., & Östergren, R. (2012). Number magnitude processing and basic cognitive functions in children with mathematical learning disabilities. *Learning and Individual Differences, 22*(6), 701-714.

Berch, D. B., & Mazzocco, M. M. (2007). *Why Is Math So Hard for Some Children? The Nature and Origins of Mathematical Learning Difficulties and Disabilities*: ERIC.

Bruyer, R. ve Brysbaert, M. (2011). Combining speed and accuracy in cognitive psychology: is the inverse efficiency score a better dependent variable than the mean reaction time (rt) and the percentage of errors (pe)? *Psychologica Belgica*, 51(1), 5-13.

Butterworth, B. (2000). *The mathematical brain*. Macmillan: London

Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2012). *Bilimsel araştırma yöntemleri*: Pegem Akademi.

Carey, S. (2001). Cognitive foundations of arithmetic: Evolution and ontogenisis. *Mind & Language, 16*(1), 37-55.

Clements, D. H. (1999). Subitizing: What is it? Why teach it? *Teaching children mathematics, 5*, 400-405.

de Castro, M. V., Bissaco, M. A. S., Panccioni, B. M., Rodrigues, S. C. M., & Domingues, A. M. (2014). Effect of a virtual environment on the development of mathematical skills in children with dyscalculia.

Dehaene, S. (2003). The neural basis of the Weber–Fechner law: a logarithmic mental number line. *Trends in cognitive sciences, 7*(4), 145-147.

Dehaene, S. (2011). *The number sense: How the mind creates mathematics*: Oxford University Press.

Desoete, A., & Praet, M. (2013). Inclusive mathematics education: the value of a computerized look-ahead approach in kindergarten: a randomized controlled study. *Transylvanian Journal of Psychology, 14*, 103-119.

Desoete, A., Roeyers, H., & De Clercq, A. (2004). Children with mathematics learning disabilities in Belgium. *Journal of learning disabilities, 37*(1), 50-61.

Feigenson, L., Dehaene, S., & Spelke, E. (2004). Core systems of number. *Trends in cognitive sciences, 8*(7), 307-314.

Fuchs, L. S., Geary, D. C., Compton, D. L., Fuchs, D., Hamlett, C. L., & Bryant, J. D. (2010). The contributions of numerosity and domain-general abilities to school readiness. *Child development, 81*(5), 1520-1533.

Gersten, R., Jordan, N. C., & Flojo, J. R. (2005). Early identification and interventions for students with mathematics difficulties. *Journal of learning disabilities, 38*(4), 293-304.

Gordon, P. (2004). Numerical cognition without words: Evidence from Amazonia. *Science, 306*(5695), 496-499.

Groffman, S. (2009). Subitizing: Vision Therapy for Math Deficits. Optometry & Vision Development, 40(4), 229-238.

Halberda, J., & Feigenson, L. (2008). Developmental change in the acuity of the" Number Sense": The Approximate Number System in 3-, 4-, 5-, and 6-year-olds and adults. *Developmental psychology, 44*(5), 1457.

Halberda, J., Mazzocco, M. M., & Feigenson, L. (2008). Individual differences in non-verbal number acuity correlate with maths achievement. *Nature, 455*(7213), 665-668.

Henik, A., Rubinsten, O., & Ashkenazi, S. (2011). The "where" and "what" in developmental dyscalculia. *The Clinical Neuropsychologist, 25*(6), 989-1008.

Izard, V., Pica, P., Spelke, E. S., & Dehaene, S. (2008). Exact equality and successor function: Two key concepts on the path towards understanding exact numbers. *Philosophical Psychology, 21*(4), 491-505.

Izard, V., Sann, C., Spelke, E. S., & Streri, A. (2009). Newborn infants perceive abstract numbers. *Proceedings of the National Academy of Sciences, 106*(25), 10382-10385.

Karagiannakis, G., Baccaglini-Frank, A., & Papadatos, Y. (2014). Mathematical learning difficulties subtypes classification. *Frontiers in human neuroscience, 8*.

Käser, T., Baschera, G.-M., Kohn, J., Kucian, K., Richtmann, V., Grond, U., von Aster, M. (2013). Design and evaluation of the computer-based training program Calcularis for enhancing numerical cognition. *Frontiers in psychology, 4*. doi: 10.3389/fpsyg.2013.00489

Kaufmann, L., Mazzocco, M. M., Dowker, A., von Aster, M., Göbel, S. M., Grabner, R. H., Kucian, K. (2013). Dyscalculia from a developmental and differential perspective. *Frontiers in psychology, 4*.

Kucian, K., Grond, U., Rotzer, S., Henzi, B., Schönmann, C., Plangger, F., . . . von Aster, M. (2011). Mental number line training in children with developmental dyscalculia. *Neuroimage, 57*(3), 782-795.

Kuhn, J.-T., & Holling, H. (2014). Number sense or working memory? The effect of two computer-based trainings on mathematical skills in elementary school. *Advances in Cognitive Psychology, 10*(2), 59.

Landerl, K., Bevan, A., & Butterworth, B. (2004). Developmental dyscalculia and basic numerical capacities: A study of 8–9-year-old students. *Cognition, 93*(2), 99-125.

Lipton, J. S., & Spelke, E. S. (2003). Origins of number sense large-number discrimination in human infants. *Psychological Science*, *14*(5), 396-401.
Maccini, P., Gagnon, J. C., & Hughes, C. A. (2002). Technology-based practices for secondary students with learning disabilities. *Learning Disability Quarterly*, *25*(4), 247-261.
McLaughlin, J., & Mertens, D. (2004). Research and evaluation methods in special education: California: Corwin Press.
Michaelson, M. T. (2007). An Overview of Dyscalculia: Methods for Ascertaining and Accommodating Dyscalculic Children in the Classroom. *Australian Mathematics Teacher*, *63*(3), 17-22.
Nys, J., Ventura, P., Fernandes, T., Querido, L., & Leybaert, J. (2013). Does math education modify the approximate number system? A comparison of schooled and unschooled adults. *Trends in Neuroscience and Education*, *2*(1), 13-22.
Obersteiner, A., Reiss, K., & Ufer, S. (2013). How training on exact or approximate mental representations of number can enhance first-grade students' basic number processing and arithmetic skills. *Learning and Instruction*, *23*, 125-135.
Olkun, S., Altun, A., Cangöz, B., Gelbal, S., & Sucuoğlu, B. (2012). Developing Tasks for Screening Dyscalculia Tendencies: E-Leader, Berlin.
Olkun, S., & Özdem, Ş. (2015). Kavramsal Şipşak Sayılama Uygulamalarının Hesaplama Performansına Etkisi. *Başkent University Journal Of Education*, *2*(1).
Östergren, R. (2013). Mathematical Learning Disability: Cognitive Conditions, Development and Predictions.
Passolunghi, M. C., & Lanfranchi, S. (2012). Domain-specific and domain-general precursors of mathematical achievement: A longitudinal study from kindergarten to first grade. *British Journal of Educational Psychology*, *82*(1), 42-63.
Piazza, M., Facoetti, A., Trussardi, A. N., Berteletti, I., Conte, S., Lucangeli, D., Zorzi, M. (2010). Developmental trajectory of number acuity reveals a severe impairment in developmental dyscalculia. *Cognition*, *116*(1), 33-41.
Räsänen, P., Salminen, J., Wilson, A. J., Aunio, P., & Dehaene, S. (2009). Computer-assisted intervention for children with low numeracy skills. *Cognitive Development*, *24*(4), 450-472.
Spelke, E. S., & Kinzler, K. D. (2007). Core knowledge. *Developmental science*, *10*(1), 89-96.
Vanbinst, K., Ghesquiere, P., & De Smedt, B. (2014). Arithmetic strategy development and its domain-specific and domain-general cognitive correlates: A longitudinal study in children with persistent mathematical learning difficulties. *Research in developmental disabilities*, *35*(11), 3001-3013.
von Aster, M. G., & Shalev, R. S. (2007). Number development and developmental dyscalculia. *Developmental Medicine & Child Neurology*, *49*, 868-873.
Wilson, A. J., Revkin, S. K., Cohen, D., Cohen, L., & Dehaene, S. (2006). An open trial assessment of "The Number Race", an adaptive computer game for remediation of dyscalculia. *Behavioral and Brain Functions*, *2*, 20.

The Impact of Learner Characteristics on the Multi-Dimensional Construct of Social Presence

Professor David Mykota
Department of Educational Psychology and Special Education, College of Education, University of Saskatchewan, Saskatoon, SK. S7N 0X1
david.mykota@usask.ca

ABSTRACT
This study explored the impact of learner characteristics on the multi-dimensional construct of social presence as measured by the computer-mediated communication questionnaire. Using Multiple Analysis of Variance findings reveal that the number of online courses taken and computer-mediated communication experience significantly affect the dimensions of social presence. Findings confirm that significant effects were found to impact three of the four dimensions of social presence, however, no interaction effects for the independent variables were observed. Recommendations for the effective use of online learning recognize that interaction patterns need be structured and pre-course instructional activities be provided so novice learners can acquaint themselves with asynchronous and synchronous online learning environments.

Keywords: online learning, social presence, learner characteristics, computer-mediated communication

INTRODUCTION
Part of the challenge in maintaining quality learning environments, is keeping pace with the plethora of social communication tools characteristic of the medium available that can facilitate social processes and authentic learning experiences (Dunlap & Lowenthal, 2009). To help understand social and interpersonal communication in an online learning environment the multi-dimensional and multi-layered construct of social presence was developed. Social presence has long attracted attention of those involved in computer-mediated communication (CMC) that is typified by collaborative learning environments. One of the primary objectives for online learning has been the creation of an environment where the learner is at ease and experiences comfort in their communications with others (i.e. social presence). This is viewed as desirable because evidence suggests that when learners experience a high degree of social presence they are more likely to engage their cognitive presence in higher order thinking (Garrison, Anderson, & Archer, 2000; Garrison, Cleveland-Innes, & Fung, 2010); actively participate in online communications (Danchak, Walther, & Swan, 2001; Cui, Lockee, & Meng, 2013); are less likely to drop out of their classes (Bowers & Kumar, 2015; Robb & Sutton, 2014); and are more satisfied with their learning experience (Gunawardena & Zittle, 1997; Moallem, 2015; So & Brush, 2008). As a result, social presence has come to be considered the critical affective component and is one of the more important constructs in determining the level of interaction and effectiveness of learning in an online environment (Borup, West, & Graham, 2012; Kim, Kwon, & Cho, 2011; McIssac & Gunawardena, 1996; Lobry de Bruyn, 2004; Mykota & Duncan, 2007; Mykota, 2015; Richardson & Swan, 2003).

However, the persistence and motivation of students taking online courses can also be influenced by learner characteristics that include age and sex (Packham, Jones, Miller, & Thomas, 2004); one's readiness for online learning (Smith, Murphy, & Mahoney, 2003); computer self-efficacy (Compeau & Higgins, 1995; Hayashi, Chen, Ryan, & Wu, 2004); the learner's cognitive characteristics (i.e. learning style and metacognitive skills); and preference or need for social interaction within the learning environment (i.e. group work and class discussion; Miller & Miller, 2000).

As education is a social event it is important to understand the relationship between social presence and learner characteristics. By improving the quality of student experiences and by engaging students as active participants in the learning experience the modernization of flexible and open higher education learning environments can be achieved. Therefore, the purpose of the present study is to determine how learner's computer-mediated communication experience and number of online courses taken interact with the multi-dimensional characteristics of social presence as measured by the computer-mediated communication questionnaire (CMCQ; Tu, 2005).

PEDAGOGY AND SOCIAL PRESENCE
The genesis of social presence theory lies in the conceptualization from social psychology of immediacy (Weiner & Mehrabian, 1968) and intimacy (Argyle & Dean, 1965) surrounding face-to-face communication. In face-to-

face communication, immediacy refers to the psychological distance between two speakers, whereas intimacy is the closeness obtained, verbally and non-verbally, among individuals and maintained by immediacy behaviours (Rettie, 2003). When applied to CMC, Short, Williams, and Christie (1976) defined social presence as the "degree of salience of the other person in the communication and the consequent salience of the interpersonal relationships" (p. 65).

These earlier efforts in the development of social presence theory were specific to business and organizational environments focusing on CMC. Over time thinking changed on how we perceive interpersonal and social communication, which subsequently influenced social presence research. This re-conceptualization of social presence theory from a strictly technologically determined event to one that was co-determined by social and interpersonal interactions was, in part, a result of educational researchers exploring the effects of the construct in online learning.

For example, Gunawardena (1995) in her study on social presence theory concluded that immediacy behaviours enhance and maintain social presence and that those who moderate CMC need to promote a sense of online community so that interaction in collaborative learning environments can occur. By so doing the degree to which an individual in an online learning environment is perceived as a real person is enhanced.

In framing good pedagogical practices for online learning, Garrison et al. (2000) developed the community of inquiry model to recognize the transactional relationship between instructors and learners through the interaction of cognitive presence (of the learner), teaching presence (i.e. the structure and process), and social presence (i.e. affective interpersonal communication). According to Garrison et al. (2000), these elements, which define the community of inquiry model, are fundamental to a successful higher education learning experience. A key component in the model is the concept of social presence, which refers to the extent an individual, is able to present himself or herself emotionally and socially in an online environment as a real person.

With increased attention being focused on social presence theory as applied to online learning various attempts at measuring the construct occurred. As a result, researchers began to test hypothesis on the effects of social presence in online learning environments. With these developments the interpretation of social presence theory and the differences in how it was being defined and operationalized became more apparent.

In assessing social presence through the coding and analyzing of CMC text based transcripts three categories of communicative responses were identified by Rourke, Anderson, Garrison, and Archer (2001) that include affective indicators (i.e. values, beliefs, feelings, and emotions); cohesive indicators (i.e. group presence and commitment); and interactive indicators (i.e. attending in a socially meaningful way). Although Rourke et al. (2001) recognized that the coding and analyzing of CMC text based transcripts using the aforementioned indicators provided a measure of the density of social presence, they also believed future exploratory studies including factor analysis would aid in further defining the construct.

Tu and McIssac (2002) elaborated on the construct by defining social presence as the "degree of feeling, perception, and reaction of being connected via CMC to another intellectual entity"(p.140). Tu (2005) incorporating social learning theory developed and validated (Tu & Yen; 2006; Yen & Tu, 2008) the computer-mediated communication questionnaire (CMCQ). In the initial exploratory factor analysis validation study a four-factor solution comprised of Online Communication, Privacy, Social Context, and Interactivity factors were found to exist (Yen & Tu, 2004; Tu & Yen; 2006). Subsequently, a confirmatory factor analysis using structural equation modeling supported Tu and Yen's (2006) previous findings that social presence was not a unitary construct and that the CMCQ (Tu, 2005) represented a multi-dimensional solution for the construct (Yen & Tu, 2008).

As illustrated by the aforementioned brief review, the understanding of what comprises effective affective communication has become more complex. As a result, social presence and its theoretical underpinnings have come to be understood as a multi-layered and multifaceted phenomenon with definitions tending to fall along a continuum making it difficult to aggregate findings to determine what is working and what is not (Kreijns, Van Acker, Vermeulen, Van Buuren, 2014; Lowenthal, 2010). These definitional ambiguities might seem superfluous, but the interaction between on-task and off-task social interactions within the cognitive, learning, and social/interpersonal dimensions are important to the understanding of how best to structure, develop, and facilitate online learning environments that engage and retain learners (Kreijns, Kirschner, & Vermeulen, 2013).

Subsequent investigations with the CMCQ (Tu, 2005) have added insight into how to interpret the construct while adding to the extant research on the instrument and the effects of social presence on learners. In this

respect, differences in how individuals perceive and experience social presence in online learning environs have been found to exist. For example, differences in the format used (i.e. email, discussion, or chat), proficiency in online learning media environments (Tu & Yen, 2007), and learner characteristics (Mykota & Duncan, 2007) all impact the social presence of learners as measured by the CMCQ. While others report that social presence does not affect preference in choice between online learning and face-to-face group formats (Stein & Wanstreet, 2003) and that gender is not a significant predictor of social presence (Tu et al., 2011).

As previously alluded to four different aspects of social presence were found to occur when using the CMCQ (Tu, 2005) to measure the construct. These dimensions of social presence include Social Context, Privacy, Interactivity, and Online Communication and have been reported on through the conducting of an exploratory factor analysis (Tu & Yen, 2006) and confirmatory factor analysis (Yen & Tu, 2008; 2011).

The Privacy factor relates to the confidentiality of the CMC medium both on a personal and technical level and includes the degree to which learners can express their personal stories and feelings in confidence. The feeling of privacy is associated to the learner's perception psychologically that their communications within an online environmnet are confidential when they are intended to be so, whereas system privavcy is the extent to which the technological aspects of online communication are perceived as secure (Tu & Yen, 2006). The Social Context factor realtes to the ability of CMC users to build trusting and caring social relationships. With trusting relationships the degree of intimacy in the online environment can be enhanced with social relationships being developed. The Interactivity factor relates to one's CMC skill set, which includes the immediacy of responses and comfort with the various communication styles used by others within the online learning environment. For example, informality in communication styles, familiarity with topics posed for discussion, and overall comfort level in discussing topics can all effect interactivity and the subsequent immediacy of the communicative intent (Tu & Yen, 2006). Whereas, the Online Communication factor refers to the ability of CMC users to express themselves through the medium such that the attributes of text based learning environments do not impede one's ability to communicate socially. Online Communication is experienced through the use of asynchronous tools (i.e. email and discussion) and sychronous communication channels (i.e. chat or real time video) that allow learners to colloborate with one another (Stein & Wanstreet, 2003; Yen & Tu, 2008). In this sense, the Online Communication factor of social presence is more related to the attributes of the online learning environment.

In assessing the underlying factors which comprise social presence as represented in the CMCQ (Tu, 2005), perception differences were found to exist such that the cultural backgrounds of learners influenced the Social Context, Privacy, and Interactivity domains while Online Communication was viewed as the least relevant component (Yen & Tu, 2011). As to why, possible contextual factors that include the cultural mindset of the learners and their communication patterns could have impacted perceptions of the different aspects of social presence reported (Yen & Tu, 2011).

However, except for the aforementioned study there is a dearth of research on the multi-dimensional nature of social presence as measured by the CMCQ (Tu, 2005) and the impact on learner characteristics. To address this gap, the present study seeks to ascertain if learners' self rated experience with computer-mediated communication and the number of online courses taken act independently or interact together thereby resulting in a significant effect on the dimensions of social presence that include Social Context, Privacy, Interactivity and Online Communication as measured by the CMCQ (Tu, 2005).

METHODS

The participant sample was derived from students enrolled in a graduate program offered at the University of Saskatchewan. The graduate program is comprised of nine online courses that are delivered over two years. Using convenience sampling, 273 students (90% response rate) enrolled in the program participated in the study by voluntarily completing the survey package that included a demographic and social presence questionnaire (CMCQ; Tu, 2005). The sentence stems on the CMCQ (Tu, 2005) were used to identify social presence in a text-based system with the CMC tools email, discussion, and chat. The respondent was asked to complete the instrument on the basis of a five-point Likert scale converted to a numerical weighting ranging in options from 0 (uncertain); 1 (strongly disagree); 2 (disagree); 3 (agree); and 4 (strongly agree). Previous findings of the score validity and score reliability (Yen & Tu, 2004) of the CMCQ confirmed a 12 item four-factor structure. This was further supported by a confirmatory factor analysis (Yen & Tu, 2008) and multi-group confirmatory factor analysis that determined the instrument was measuring the same construct across varying groups (Yen & Tu, 2011). In all cases (Yen & Tu, 2004; Yen & Tu, 2008; Yen & Tu, 2011) the 12 item four-factor structure had moderately high factor loadings (i.e. >.32), which was deemed acceptable for retention (Comrey & Lee, 1992). Based on the previously reported findings it was deemed appropriate that the four-factor structure of social

presence, which includes the Privacy, Interactivity, Social Context, and Online Communication dimensions, was appropriate for inclusion in the present study.

The frequency counts for the demographic variables sex, number of online courses taken, and self-rated computer-mediated communication experience are reported in Table 1. When examining the frequency counts, it was found that although sex was initially a variable considered having a potential impact it was excluded from further analysis because of the low number of males in the sample. For purposes of the present study, analysis was conducted using a 2 X 4 MANOVA with Number of Online Courses and Computer-Mediated Communication Experience as the fixed factors and total scores for the Privacy, Interactivity, Social Context, and Online Communication domains as the dependent variables. Accordingly, the study sought to explore what were the main effects of the fixed factors Number of Online Courses and Computer Mediated Communication Experience (i.e. the independent variables) on the dependent variables (i.e. Privacy, Interactivity, Social Context and Online Communication domains) and what were the interactions, if any, among the independent variables.

Table 1. Frequency Demographics, N=273

	Frequency	Percent
Sex		
Male	20	7.3
Female	253	92.7
CMC Experience		
Novice to Average	169	61.9
Intermediate to Expert	104	38.1
Number of Online Courses		
1 course	109	39.9
2-3 courses	78	28.6
4 or more courses	86	31.5

RESULTS

Data was analyzed using SPSS Statistics Version 24. In conducting the analysis it was found that the MANOVA statistical assumptions were met. Box's Test of Equality of Covariance Matrices was not significant (.848; p<.05) for the dependent variables indicating there was not a significant variation in the covariance matrices and there was not a violation of homoscedasticity. The test of group differences (i.e. Pillai's Trace) was robust with the sample sizes equal between groups (Field, 2013). Levene's Test of Equality of Error Variances (i.e. p<.05) was not significant on all four of the subscale scores for the Social Context (.549), Privacy (.972), Interactivity (.065), and Online Communication (.12) factors of the CMCQ. However, it should also be noted that the sample is skewed towards gender (i.e. females) and that although research on the construct social presence with the CMCQ has found that gender differences do not appear to exist (Tu et al., 2011) the results need be interpreted within this limitation.

The results of the 2 X 4 MANOVA with CMC Experience and Number of Online Courses as the fixed factors (independent variables) and the four dependent variables Social Context, Privacy, Interactivity, and Online Communication are presented in Table 2. With the large group sizes and the observed power being >.7, it was deemed acceptable to set alpha at .1 for tests of significance (Stevens, 2012). For the multivariate analysis two significant effects occurred. Number of Online Courses had a significant effect on the dependent variables V = .064, $F(8, 530) = 2.2$, p = .026 and CMC Experience also had a significant effect on the dependent variables V = .032, F (4, 264) = 2.2, p = .068. In spite of this, there was not a statistically significant interaction effect between Number of Online Courses and CMC Experience on the combined dependent variables V = .037, F (8, 530) = 1.24, p = .270.

Table 2. Multivariate Analysis for Four Dependent Variables

Source	*df*(num./denom.)	F ratio	Eta^2	Power
No. of Online Courses	8,530	2.204*	.032	.922
CMC Experience	4,264	2.211*	.032	.757
No. of Online Courses x CMC Experience	8,530	1.238	.019	.702

*p<.1

The univariate ANOVA results indicated that with Number of Online Courses as the independent variable the dependent variables Social Context $F(2, 267) = 4.16$, $p = .017$ and Online Communication $F(2, 267) = 5.33$, $p = .005$ were significant, while the dependent variables Interactivity $F(2, 267) = .849$, $p = .429$ and Privacy $F(2, 267) = 1.16$, $p = .315$ were not. Correspondingly, the univariate ANOVA results indicated that with CMC Experience as the independent variable, the dependent variables Online Communication $F(2, 267) = 2.32$, $p = .011$ and Interactivity $F(2, 267) = 4.81$, $p = .029$ were significant while the dependent variables Social Context $F(2, 267) = 3.73$, $p = .236$ and Privacy $F(2, 267) = .081$, $p = .776$, were not. Additionally, there were no significant univariate effects for the dependent variables on the multivariate interaction.

The univariate analysis of variance results are reported in Table 3. The observed means and standard deviations for Number of Online Courses and the dependent variables are displayed in Table 4. The observed means and standard deviations for CMC Experience and the dependent variables are displayed in Table 5. In all instances the means for the dependent variables are higher as function of greater CMC Experience. Furthermore, in most cases the means for the dependent variables increased as a function of number of classes taken with the exception of the Interactivity domain in which the means for 4 or more courses and 2 -3 courses were close to equivalency while the mean for 1 course was lower than both.

Table 3. Univariate Analysis of Variance: F Ratios for Four Dependent Variables

Measure	No. of Online Courses	CMC Experience	No. of Online Courses x CMC Experience
	MS (2,267)	MS (1,267)	MS (2,267)
Social Context	4.16*	.797	1.453
Privacy	1.16	.081	1.618
Online Communication	5.331*	6.503*	1.257
Interactivity	.849	4.812*	.261

*p<.1

Table 4. Observed Means and Standard Deviations for Number of Online Courses

Variables	No. of Online Courses					
	1 Course n=112		2-3 Courses n=78		4 or More Courses n=86	
	M	*SD*	*M*	*SD*	*M*	*SD*
Social Context	8.107	2.455	8.897	2.921	9.035	2.834
Interactivity	7.369	2.022	7.743	2.165	7.698	1.715
Online Communication	5.116	1.493	5.705	1.301	5.558	1.212
Privacy	4.541	2.713	5.103	2.771	4.569	2.716

*p<.1

Table 5. Observed Means and Standard Deviations for CMC Experience

Variables	Novice to Average n=171		Intermediate to Expert n=105	
	M	*SD*	*M*	*SD*
Social Context	8.526	2.684	8.771	2.826
Interactivity	7.365	2.097	7.924	1.714
Online Communication	5.2647	1.438	5.669	1.270
Privacy	4.659	2.773	4.791	2.677

*p<.1

DISCUSSION

The present study explored how the number of online courses taken and computer-mediated communication experience impacted the dimensions of social presence as measured by the CMCQ (Tu, 2005) and what if any interaction effects occurred between the independent variables (Number of Online Courses and CMC Experience) on the dependent variables Social Context, Privacy, Interactivity, and Online Communication (i.e. the dimensions of social presence). As would be expected, the mean scores for the dimensions of social presence increase as a function of number of online courses taken and the degree of computer-mediated communication experience an individual has. Although no interaction effects were found between the independent variables, significant effects were found for the independent variables on the dependent variables.

Logically, it would be expected that learner's with greater CMC experience would be more comfortable online and therefore more likely to engage in their learning environment as there is a familiarity with the medium and the technological determination of events. In the present study, it was found that these effects were most pronounced for the Interactivity and Online Communication domains.

The Interactivity factor relates to one's aptitude toward the computer-mediated medium which impacts the immediacy of responses. For example, this includes the ablity to accommodate differing communication styles while not being inhibited by unfamiliar discussion topics. Findings indicate that learner interactivity is greatest among those who have a high degree of CMC experience. Interactivity, however, was not found to have had a significant effect as based on Number of Online Courses taken. Although, those who had only enrolled in one course experienced less Interactivity, a significant effect was not found for the independent variable Number of Online Courses. What this implies then is that gains in CMC experience as it pertains to the Interactivity domain are not dependent in of themselves on the online learning environment rather they are developed within the various social interaction tools (i.e. email, blogs, discussion forums, facebook and twitter) that are available through computer-mediated communication and more broadly the Internet. In this respect, novice online students with limited computer-mediated communication experience need to be made aware of how interaction is structured for online learning. Therefore, instructors need to construct interaction patterns to overcome the inherent challenges of the medium.

Findings also reveal that the Online Communication dimension of social presence was higher for those whom had more CMC Experience and lowest among those who had only taken one course. Online Communication is viewed as a technical proficiency attributable to the learner that is learnt both as a function of CMC Experience and Number of Online Courses Taken. Ease of communication is a skill set, which can be acquired through the Internet or other computer-mediated environs, then applied, and further developed in both synchronous and asynchronous learning environments. Accordingly, if educators desire learners to be highly collaborative in their professional practice, it is important that students are provided pre-course instructional activities necessary to embrace computer-mediated communication so as to ensure best practices in their course work.

The Social Context domain was significantly impacted by the amount of course work undertaken but not by the degree of CMC experience a learner had acquired. Social Context refers to affective communication that develops over time and includes the feeling, emotion, and growth of trusting relationships one can experience in an online environment. It would appear then that Social Context is intrinsic to an online learning environment as it is fostered by the interactions that occur between online learners and instructors within a course. The informality and friendliness modeled by the instructor coupled with frequent interaction can sustain this process (Tu, 2002).

The Social Context and Interactivity dimensions of social presence are also cultivated by instructors through their contribution to discussions, replying promptly to email, addressing students by their first names, and becoming acquainted with the posted biographies of students (Aragon, 2003). Informality in communication styles, familiarity with topics posed for discussion, and the overall comfort level in discussing topics can all effect the subsequent immediacy of the communicative intent (Tu & Yen, 2006).

Social presence, more generally speaking, can be developed through instructional design strategies that include limiting enrolment (i.e. to a 30:1 ratio; Rovai, 2001) development of collaborative course assignments (Aragon, 2003; Mykota, 2013, So & Brush, 2008; Yen & Tu, 2011) and enhanced media integration (Kim et al., 2011). What this implies is that development and support for faculty in delivery of online courses is needed. Therefore, by undertaking the aforementioned recommendations instructors, students, and course designers can overcome some of the inherent barriers to the creation of social presence.

LIMITATIONS

The study is limited through the use of convenience sampling and the homogeneity of the sample as it relates to gender. In this respect, the interpretation and generalization of this study needs be understood within these limitations.

CONCLUSION

This study contributes to the knowledge and research on social presence through the applied measurement of the construct and its dimensions. Future research should continue to explore the construct social presence and its ensuing dimensions, as measured by the CMCQ (Tu, 2005), with varying samples and contexts. Additionally, qualitative phenomenological or grounded theory studies could be conducted to delve in-depth into the meaning of affective communication and its effect on the learner's cognitive presence. In turn, a clearer conceptualization of what represents the dimensionality of social presence will enable researchers to test hypothesis and conduct comparative analysis of the construct. By focusing on the empirical validation of the dimensional framework evidenced based research practices in online learning environments can continue to be advanced.

REFERENCES

Aragon, S. (2003). Creating social presence in online environments. *New Directions for Adult and Continuing Education, 100*, 57-68.

Argyle, M., & Dean, J. (1965). Eye contact, distance and affiliation. *Sociometry, 28*, 289-304.

Borup, J., West, R. E., & Graham, C. R. (2012). Improving online social presence through asynchronous video. *The Internet and Higher Education, 15*(3), 195-203.

Bowers, J., & Kumar, P. (2015). Students' perceptions of teaching and social presence: A comparative analysis of face-to-face and online learning environments. *International Journal of Web-Based Learning and Teaching Technologies, 10*(1), 27-44.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*, 189-211.

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis.* Hillsdale, NJ: Erlbaum.

Cui, G., Lockee, B., & Meng, C. (2013). Building modern online social presence: A review of social presence theory and its instructional design implications for future trends. *Education and Information Technologies, 18*(4), 661-685.

Danchak, M. M, Walther, J. B., & Swan, K. P. (2001). *Presence in mediated instruction: Bandwidth, behaviour, and expectancy violations.* A paper presented to the annual meeting on Asynchronous Learning Networks, Orlando, FL.

Dunlap, J. C., & Lowenthal, P. R. (2009). Tweeting the night away: Using Twitter to enhance social presence. *Journal of Information Systems Education, 20*(2), 129-135.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Sage.

Garrison, D. R., Anderson, T., Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2(*2-3), 87-105.

Garrison, D. R., Cleveland-Innes, M., & Fung, T. S. (2010). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *The Internet and Higher Education, 13*(1), 31-36.

Gunawardena, C. N. & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *The American Journal of Distance Education, 11*(3), 8-26.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications, 1*(2/3), 147-166.

Hayashi, A., Chen, C., Ryan, T., & Wu, J. (2004). The role of social presence and moderating role of computer self-efficacy in predicting the continuance usage of e-learning systems. *Journal of Information Systems Education, 15*(2), 139-154.

Kim, J., Kwon, Y., & Cho, D. (2011). Investigating factors that influence social presence and learning outcomes in distance higher education. *Computers and Education, 57*, 1512-1520.

Kreijns, K., Kirschner, P. A., & Vermeulen, M. (2013). Social aspects of CSCL: A research framework. *Educational Psychologist, 48*(4), 229-242.

Kreijns, K., Van Acker, F., Vermeulen, M., & Van Buuren, H. (2014). Community of Inquiry: Social presence revisited. *E-Learning and Digital Media, 11*(1), 5-18.

Lobry de Bruyn, L. (2004). Monitoring online communication: Can the development of convergence and social presence indicate an interactive learning environment? *Distance Education, 25*(1), 67-81.

Lowenthal, P. R. (2010). The evolution and influence of social presence theory on online learning, In Kidd, T. (Ed.), *Online education and adult learning: New frontiers for teaching practices* (pp. 124-139), Hershey, PA: IGI Global.

McIsaac, M. S., & Gunawardena, C. N. (1996). Distant education. In D. Jonassen (Ed.), *Handbook for*

research on educational communications and technology (pp .403-437). NY: Scholastic Press.
Miller, S. M. & Miller, K. L. (2000). Theoretical and practical considerations in the design of web-based instruction. In B. Abbey (Ed.), *Instructional and cognitive impacts of web-based education* (pp. 156-177). Hershey, PA: Idea Group Publishing.
Moallem, M. (2015). The impact of synchronous and asynchronous communication tools on learner self-regulation, social presence, immediacy, intimacy and satisfaction in collaborative online learning. *The Online Journal of Distance Education and e-Learning, 3*(3), 55.
Mykota, D. B., & Duncan, R. (2007). Learner characteristics as predictors of online social presence. *Canadian Journal of Education, 30*(1), 157-170.
Mykota, D., (2013). A coordinated decentralized approach to online project development. *Turkish Online Journal of Educational Technology, 12*(3), 1-14.
Mykota, D. B., (2015). The influence of learner characteristics on social presence. *Procedia-Social and Behavioral Sciences, 176*, 627-632.
Packham, G., Jones, P., Miller, C., & Thomas, B. (2004). E-learning and retention: Key factors influencing student withdrawal. *Education and Training, 46*(6/7), 335-342.
Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks, 7*(1), 68-88.
Rettie, R. (2003). *Connectedness, awareness and social presence*. Paper presented at the 6th International Presence Workshop, Aalborg University, Aalborg, Denmark
Robb, C. A., & Sutton, J. (2014). The importance of social presence and motivation in distance learning. *Journal of Technology, Management and Applied Engineering, 31*(1-3), 1-10.
Rourke, L., Anderson, T., Garrison, R. D., & Archer, W. (2001). Assessing social presence in asynchronous text-based computer conferencing. *Journal of Distance Education, 4*(21), 50-71.
Rovai, A. P. (2001). Building and sustaining community in asynchronous learning networks. *Internet and Higher Education, 3(2000),* 285-297.
Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications.* London: John Wiley & Sons.
Smith, P. J., Murphy, K. L., & Mahoney, S. E. (2003). Towards identifying factors underlying readiness for online learning: An exploratory study. *Distance Education, 24*(1), 57-67.
So, H-J. & Brush, T. A. (2008). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors. *Computers & Education, 51,* 318-336.
Stein, D. S., & Wanstreet, C. E. (2003). *Role of social presence, choice of online or face to-face group format, and satisfaction with perceived knowledge gained in a distance learning environment.* Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.
Stevens, J. P. (2012). *Applied multivariate statistics for the social sciences.* Routledge.
Tu, C. H. (2002). The measurement of social presence in an online learning environment. *International Journal on E-Learning, 1*(2), 34-45.
Tu, C. H. (2005). *Computer-mediated communication questionnaire*. Flagstaff, AZ: Author.
Tu, C. H., & McIssac, M. S. (2002). An examination of social presence to increase interaction in online classes. *American Journal of Distance Education, 16*(2), 131-150.
Tu, C. H., & Yen, C. J. (2006). A study of multidimensional online social presence. In L. W. Cooke (Ed.), *Frontiers in higher education* (pp.77-104). Hauppauge, NY: Nova Science.
Tu, C. H., & Yen, C. J. (2007). *A study of the relationship between computer-mediated communication proficiency and online social presence*. Presented at the annual conference of AERA, Chicago, IL.
Tu, C. H., Yen, C. J., & Blocher, M. (2011). A study of the relationship between gender and online social presence. *International Journal of Online Pedagogy and Course Design, 1*(3), 33-49.
Yen, C. H., & Tu, C. H. (2004). *Revisit the measurement of online social presence*. In meeting of the Annual Conference of the American Educational Research Association, San Diego, CA.
Yen, C. J., & Tu, C. H. (2008). Online social presence: A study of the score validity of the computer mediated questionnaire. *Quarterly Review of Distance Education, 9*(3), 297
Yen, C. J., & Tu, C. H. (2011). A multiple group confirmatory factor analysis of the scores for online social presence: Do they measure the same thing across cultural groups? *Journal of Educational Computing Research, 44*(2) 219-242,
Wiener, M., & Mehrabian, A. (1968). *Language within language: Immediacy, a channel in verbal communication.* New York, NY. Appleton-Century-Crofts.

Using an Instant Messenger to Learn a Foreign Language in a Peer-Tutoring Environment

Joeun Baek
Boise State University, USA
joeunbaek@u.boisestate.edu

Yungtai Yoo
Boise State University, USA
yungtaiyoo@u.boisestate.edu

Kyungsuk Lee
Boise State University, USA
kyungsuklee@boisestate.edu

Bokmoon Jung
Korea National University of Education
jbm0215@gmail.com

Youngkyun Baek
Boise State University, USA
youngkyunbaek@boisestate.edu

ABSTRACT
This study explores useful ways of using an instant messenger in a peer-tutoring environment when two students exchange their mother languages. Seven learners of Korean and seven Korean students learning English were paired randomly to conduct language exchange via an instant messenger, KakaoTalk. The pairs (five of male and female pair and two of same gender pair) were engaged in a one-hour session once a week for ten weeks, half an hour in Korean and half an hour in English. The meeting aimed to improve partner's pronunciation, vocabulary and understanding of the cultures. The results of the exchange activities showed the positive impacts of language exchange for students.

Keywords: Korean language, peer tutoring, instant messenger, KakaoTalk

INTRODUCTION
A central goal of modern approaches to language teaching, including communicative language teaching, task-based learning, process approaches to writing and training in language learning strategies, is to enhance student autonomy and control over the language learning process (Warschauer, & Turbee 1996). Computer-Assisted Language Learning (CALL), which in its early days was dominated by "drill and kill" instructional programs, has also embraced this goal. New multimedia programs allow students more choice and flexibility in working with materials for their learning. Programs such as word processing and desk-top publishing do not attempt to deliver instruction but instead provide an instrument for students to express their thoughts and ideas. The most recent, and some believe revolutionary, application of the computer as an instrument for communication in the foreign language classroom is social networks. These networks take advantage of computer mediated communication (CMC) to bring together pairs and groups of students for collaborative learning projects in a single classroom or in various classrooms around the world" (Warschauer, & Turbee 1996).

Instant Messaging (IM) and more generally 'presence awareness' is one of the fastest-growing applications in history, used increasingly by companies and learning organizations to bring together online populations. There are now well over 200 million instant messaging users worldwide divided among the 'big four' messengers (AOL Instant Messenger, ICQ, MSN Messenger, Yahoo! Messenger), and it is believed that by 2004, 60 percent of real-time communication, including voice, text or call-and-response, will be driven by Instant Messaging technology (Eisenstadt, Komzak, & Dzbor, M., 2003). It was already being claimed that, at least in the UK, mobile technologies were "a familiar part of the lives of most teachers and students" (Facer, 2004, P. 1). Yet their integration into teaching and learning has been more gradual, as educators have sought to understand how best to use their tools to support various kinds of learning (Kukulska-Hulme & Shield 2007).

The interuniversity, collaborative experiments described at length in this article make full use of network communication and the instrumentality of computers, attributing a central position to goal- oriented activity in the teaching and learning paradigm. They constitute a powerful language learning model going well beyond the "chat line" stage on which many network experiments are based. While this type of casual exchange has its place, the continuing use of networks must anchor itself to redefined goals, priorities, and a unifying conception of what should transpire in the language classroom, thus creating an environment capable of fostering natural and productive language learning (Barson, Frommer, & Schwartz 1992).

Recent research on Internet interest communities has suggested that they provide rich empirical grounds for exploring the varied forms of second language engagement, development, and socialization that are taking place via new information and communication technologies. Early explorations of CMC posited the emergence of netspeak (Crystal, 2001), or homogenized language varieties that developed in tandem with the use of online media such as email and Internet Relay Chat (IRC). However, more recent sociolinguistic research has focused on the wide range of new media practices that proliferate in distinct online contexts. In particular, such work has drawn attention to the ways that multiple languages and emergent discourse practices are used to construct relationships and establish social identities online (Androutsopoulos, 2006). The research reviewed in the following section addresses the ways that individuals use first language and second language proficiencies for the discursive construction of self and social relationships in a variety of Internet interest communities (Thome, Black, & Sykes, 2009).

In school, work, social, and recreational settings, new media and communication technologies enable, and indeed require, participants to perform and modify presentations of individual and group identity, a dynamic that Thurlow and McKay (2003) have described as "the Internet as learning and lifestyle resource" (p. 98). The mercurial rise in digitally mediated communication has radically transformed everyday practices in the areas of relationship development and main tenance as well as information consumption and production. The primary objective of this study is to explore useful ways of using an instant messenger in a peer tutoring environment when two students exchange their mother languages.

ROLES OF TECHNOLOGU IN LEARNING LANGAUGES

Instant Messaging and Mobile communication

Mobile learning is undergoing rapid evolution. Early generations of mobile learning projects tended to propose formally-designed activities, carefully crafted by educators and technologists, and using emerging technologies that were not yet widely accessible or well understood. Current widespread ownership of mobile and wireless devices means that learners are increasingly in a position to take the lead and engage in activities motivated by their personal needs and circumstances of use, including those arising from greater mobility and travel (Kukulska-Hulme, Traxler, & Pettit, 2007).

Mobile phones are becoming more widely used in learning vocabulary, as is shown in a number of studies (Chen & Chung, 2008; Kennedy & Levy, 2008; Lu, 2008; Pincas, 2004; Stockwell, 2008; Stockwell, 2010; Thornton & Houser, 2005; Yamaguchi, 2005). In one study, Lu (2008) had students learn two sets of English vocabulary words either through mobile phones or by a paper-based format. Students who learned via SMS were found to understand more words than students presented with the paper-based tasks. Kennedy and Levy's (2008) research investigated the acceptability of a pushed mode of mobile phone operation; these authors sent short messages containing known words and new words mixed together. They found that the students appreciated the experience of reviewing learnt information and that the students found the message content often useful or enjoyable. Butgereit and Botha (2009) described a system that allows language teachers to create spelling lists or vocabulary lists in English and Afrikaans. The system then generates a fun mobile phone application using multiple texts-to-speech engines to encourage African pupils to practice spelling the words. Cavus and Ibrahim (2009) developed a system to send technical English language words together with the meanings in the form of SMSs. Studies have also shown that MALL's utility is not just limited to vocabulary learning; mobile phones can also be applied to other learning situations. Comas-Quinn and Mardomingo (2009) carried out a mobile learning project to engage learners in the creation of an online resource that focuses on a foreign culture. In their project, students used their mobile phones, digital cameras, and MP3 recorders to select and record samples of their encounters with foreign cultures; students then sent or uploaded these encounters to a cultural blog to be shared with other group members. Chang and Hsu (2011) developed a system to integrate an instant translation mode, an instant translation annotation mode, and an instant multi-user shared translation annotation function to support a synchronously intensive reading course in the normal classroom. The project was designed for personal digital assistants (PDAs), not really for mobile phones. Demouy and Kukulska-Hulme (2010) also reported on a project that allowed students to use iPods and MP3 players, as well as mobile phones, to practice

listening and speaking. They found that whilst project participants readily adopted the use of iPods and MP3 players, the process of doing activities on mobile phones was deemed less satisfying. (Wang & Smith, 2013)

Peer-to-Peer Networking and Exchanging
Some language educators have recommended use of peer-to-peer (P2P) for sharing of teaching resources, though it has not been widely used for that purpose, due perhaps to the discrediting of the P2P process (through copyright infringements) and of P2P software (through intrusive adware and spyware). One interesting example, however, is the built-in P2P functionality of the Canadian LLEARN project for learning French (at the secondary school level). It is being used as part of the learning infrastructure to provide students a means to find and exchange resources. Peer-to-Peer networking is not new. Already a few years ago the advantages of *Peer-to-Peer* networking have been recognized and thus investigations into these architectures were made [You93] [Sim91]. Others like e.g. [Met01] and [Wra94] define *Peer-to-Peer* networks as a collection of heterogeneous distributed resources which are connected by a network. Some attempts to describe *Peer-to-Peer* networks more extensively, than in just an application specific way, define *Peer-to-Peer* simply as the opposite of *Client/Server* architectures [Sin01] [Tho98].

However, from our point of view, the most distinctive difference between *Client/Server* networking and *Peerto-Peer* networking is the concept of an entity acting as a *Servent*, which is used in *Peer-to-Peer* networks. *Servent* is an artificial word which is derived from the first syllable of the term server (.Serv-.) and the second syllable of the term client (.-ent.). Thus this term *Servent* shall represent the capability of the nodes of a *Peer-to-Peer* network of acting at the same time as server as well as a client. This is completely different to *Client/Server* networks, within which the participating nodes can either act as a Server or act as a client but cannot embrace both capabilities (Schollmeier, R 2001).

Collaborative Language Learning Using Social Network Service
Vocabulary, alongside grammar, has been one of the traditional areas of focus in CALL (Levy, 1997). Vocabulary continues to attract attention because of the sheer size of the task for the learner, its obvious importance for students with varying goals and proficiency levels, and the inherent capabilities of the computer that are more attuned to dealing with the more discrete aspects of language learning. Not surprisingly, the range of technologies is broad and includes courseware (commercial and self-developed), online activities, dictionaries, corpora and concordancing, and computer-mediated communication (CMC) technologies (Stockwell, 2007). Almost a decade later Chun (2008) noted "technological advances in acoustic phonetic software have the potential to help learners improve their pronunciation and speaking competence but that sound pedagogically-based feedback beyond simply displaying pitch curves is still lacking, yet essential" (p. 17; see also Engwall 8c Baiter, 2007).

Culture may be conveyed through receptive and productive means. Simply accessing an L2 Web site can expose learners to numerous aspects of the target culture, and much knowledge may be acquired through reading, listening, and observing. Here, authentic materials play an especially important role because they are designed by native speakers for native speakers and, therefore, provide real data for any exploration of the L2 culture (Levy, 2009). Since the term mobile-assisted language learning (MALL) was first coined by Chinnery (2006), the use of mobile devices to support language learning has increased exponentially. Although, in general, MALL has been considered as a subset of both mobile learning and computer-assisted language learning, Kukulska-Hulme and Shield (2008) note that MALL differs from CALL “in its use of personal, portable devices that enable new ways of learning, emphasizing continuity or spontaneity of access and interaction across different contexts of use” (p. 273).

The literature summarizes the benefits of using MALL as follows. First, MALL enables students to more easily and more promptly access language learning materials and communicate with people at any time, from anywhere. Second, the nature of digital technology facilitates students’ participation in both collaborative and individualized language learning activities synchronously and/or asynchronously allowing rapid development of speaking, listening, reading, and writing, skills. Third, mobile technology provides various resources and tools for language learning that encourage learners to be more motivated, autonomous, situated (site-specific), and socially interactive Kim and Kwon (2012) (p. 35). Networked collaborative interaction (NCI) promotes lively exchanges by learners within a social context, a setting that facilitates the development of their communicative competence. The online tools most commonly used are e-mail, bulletin boards, and chat rooms. These tools create a socially and linguistically enriched environment for NCI (Lina, 2004).

Inquiry into online communication spaces has been particularly useful for understanding the many shifts taking place in late modern communicative and compositional practices. Over a decade ago, the New London Group

(1996) put forth a manifesto that called for a broadening of traditional language-based approaches to literacy teaching and learning to acknowledge and accommodate emergent literacy practices catalyzed by "the multiplicity of communications channels and increasing cultural and linguistic diversity in the world today" (n.p.). According to the New London Group, the term hybridity denotes "the mechanisms of creativity and of culture-as-process particularly salient in contemporary society" (n.p.). Hybridizing (i.e., the process of taking existing linguistic, semiotic, and/or cultural materials and recombining them to create new meanings) is a particularly salient aspect of contemporary youth's participation in online affinity spaces (Gee, 2005).

For example, a hybridized communicative practice common to online registers is the melding of textual and conversational styles in which users combine the conventions of print-based text with the linguistic and paralinguistic features of face-to-face conversation to create a new communicative mode that addresses the constraints of text-based media while taking advantage of the rapidity of electronic information exchange. Many modern technologies facilitate the hybridizing, or remixing, of available cultural materials by allowing users to easily combine, modify, and transform existing images, files, and texts. Lankshear and Knobel (2007) have described numerous cases of remixing literacy practices and made the following observations: Even the concept of "text" as understood in conventional print terms becomes a hazy concept when considering the enormous array of expressive media now available to everyday folk. Diverse practices of "remixing"? where a range of original materials are copied, cut, spliced, edited, reworked, and mixed into a new creation have become highly popular in part because of the quality of product it is possible for "ordinary people" to achieve, (p. 8)

METHODOLOGY

Participants and Procedure

Seven learners of Korean from Boise State University (BSU) and seven Korean students learning English at BSU were paired randomly to conduct language exchange via KakaoTalk (Korean Instant Messenger). The seven learners of Korean language are undergraduate students who registered Korean 201, Fall 2016. The seven Korean students are the students who registered Intensive English Program at Boise State University, at Fall 2016. The goal of the language exchange was to observe as a complement for the improvement of student's pronunciation, vocabulary and understanding of the cultures. The pairs (five of male and female pair and two of same gender pair) were required to engage in a one-hour session once a week for ten weeks, half an hour in Korean and half an hour in English. The participants usually had language exchange session at the Student Union Building (SUB). Most of the participants prefer face-to-face instead of messaging each other, but all of participants prefer to use instant messenger as setting up their sessions.

Following each language exchange session, each student was given two learning steps.

Figure 1:

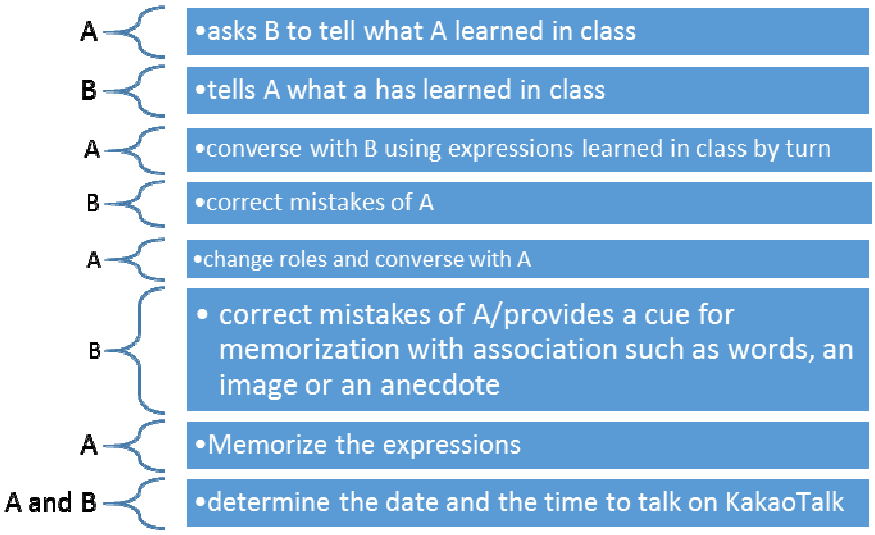


Figure 1 is the method of pronunciation learning step that given participants to improve them for effective language learning. Participants ask and converse with partner expressions learned in class.

Figure 2:

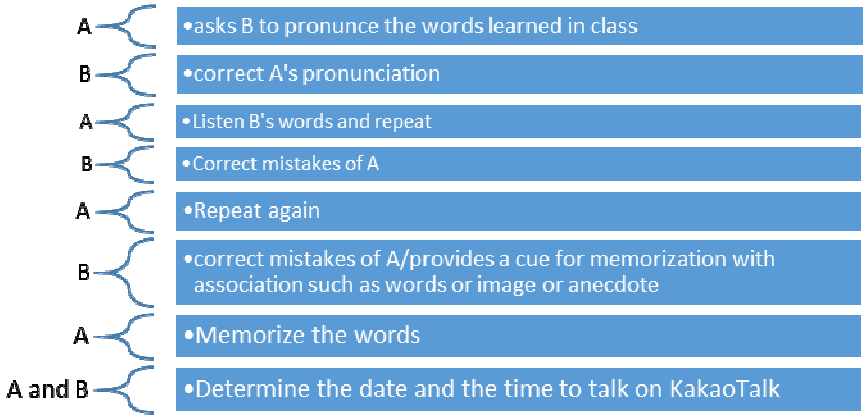


Figure 2 is the method of the vocabulary-learning step that helps participants improve their effective language learning. Participants ask the partners to pronounce the words that have learned in class and make participants repeat the words.

However, all students did not follow those learning steps and did not even know that two learning steps existed. They had a meeting once or twice a week. One of the Korean learner's partner said he could not contact with his partner anymore. Participants use instant messenger as setting up the learning sections.

Data Collection

The students from both sides were asked to complete the questionnaire for each language exchange session, and to write a journal of each session. They used KakaoTalk to set up for the next meeting. Most of students preferred a face-to-face meeting, instead of answering a question from KakaoTalk. A survey was collected twice a month. The first, second and third questionnaires had the same questions, nothing change. The first questionnaire was focused on what they learned from the language exchange meeting, how they felt about the meeting, is this meeting helpful for students or not, what is role for instant messenger, and any suggestions for improvement of this language exchange? The second questionnaire focused on what is the purpose of using instant messenger, and the learning steps that I gave to them was helpful or not. The major focus of the third questionnaire is the purpose of using instant messenger and is using instant messenger a great tool for improving language skills?

RESULTS

The findings of this survey is how they felt about this meeting, and was it helpful to improve language skills. The purpose of this question is to receive feedbacks from students about the meeting to find better improvement. All of the students responded that the language exchange sessions were helpful.

1. Describe how you feel about the meeting and is this helpful to improve your language skills?

   S1: *This meeting went well. We had not looked at the book in a while, so it felt like I recognized more when we went over it this week. Also, my partner seemed more confident in her understanding of the things she was to be tested on.*

   S2: *The meeting went well. We discussed our winter breaks and our plans for the semester.*

   S3: *This meeting was helpful. I have a better understanding of some of the topics that we do not discuss in class.*

   S4: *I believe this meeting was helpful, because we were able to get used to each other and discuss topics that we don't talk about in class.*

The first question shows that they all enjoyed having language exchange session and feel helpful for improving their language skills. All students responded they had a better understanding of some of the topics that they did not discuss in class. The second question is about what they learned and what they usually do with their partners. We are looking for what they addressed on and found out how they improved language skills, such as conversational, vocabularies, or grammar expressions.

2. Describe what you learned and what do you usually do with your partner?

   S1: *My partner helped me go over the vocab list as we discussed some common words used among the young adults.*

S2: *This week, we discussed some of the topics that we are addressed on a teaching exam that she had to take. As for practicing Korean, we went through some of the questions in my beginning Topik text book.*
S3: *My partner helped me study for the vocabulary quiz by switching between the words and contextual sentences.*
S4: *The meeting was extremely helpful as I got to learn the new vocab and partner gets to know some new English expressions and phrases.*

The second question shows that students learned new vocabulary and expressions, and some of the topics that they discussed. Studying for vocabulary quiz by switching between the words and contextual sentence and discussed some of the topics that they addressed on an exam. The major of focus is how they think about the learning steps that we suggested. We gave two different learning steps above Figure 1, and Figure 2.

3. Do you follow the learning steps? Do you think the learning steps are helpful? Why or why not?
   S1: *I do not follow the learning steps because I am more curious about other topics related to Korean culture and Korean language other than those that come from the textbook.*
   S2: *I did not even know there was such thing. I'm sure it's not helpful.*
   S3: *No, because everyone learned differently and so do I, so I have a different method.*
   S4: *Maybe for some people these learning steps are helpful, but I have a different way of doing things.*

Everyone learns differently. They are more curious about knowing other topics that does not relate from a textbook. Most of student said that they have a different method that is better than the learning steps. What they think about the purposes of using instant messenger for learning language. Finding disadvantage of using instant messenger.

4. What is the purpose of using instant messenger for learning language, such as KakaoTalk and is there any advantage or disadvantage of using instant messenger?
   S1: *It's quick. But the disadvantage of using it is sometimes there are misunderstandings.*
   S2: *I would prefer to use my built-in text-messaging app to send messages rather than sending messages on a third-party application.*
   S3: *Main disadvantage would be the lack of oral communication. While it is great at helping us keeping in touch throughout the week, it doesn't do a very good job at improving.*
   S4: *To be able to have more opportunities to stay in contact with your language partner.*

It shows the main disadvantage is the lack of oral communication. While it is great at helping them keeping in touch with their partners. The purpose of using instant messenger is for quick easy communication and organizing meetings, and instant feedback. Looking for usage of KakaoTalk. The major focus of the question is finding how we are going to apply instant messenger into learning instant messengers from their feedback.

5. Is using KakaoTalk a useful tool for learning foreign language?
   S1: *By using instant messenger, such as KakaoTalk, I can quickly get answers to questions that I may have for my language partner. So yes, I like using it.*
   S2: *It's an easy quick form of communication.*
   S3: *KakaoTalk is always useful. We are able to set meeting times and ask each other questions when necessary.*
   S4: *KakaoTalk is useful since it allows us to communicate better.*

This shows the reasons for using KakaoTalk is an easy quick form of communication and quickly receive answers to questions that we may have for their language partners. They did agree that KakaoTalk is great tool for improving language skills, meet not just for quick communication. The major focus of this question is how often meeting with partner effect improvement of language skills. Therefore, we are looking for how many often having meetings are the most effective to improve language.

6. How often do you meet with your partner?
   S1: *I meet my partner once a week. We are all happy with this arrangement, because we knew we could also contact each other if we needed help.*
   S2: W*e meet for an hour once a week. I am very satisfied. My partner is really helpful.*
   S3: *We usually meet once or twice a week with an average of 1.5 hours per week.*
   S4: *We meet each other once a week.*

Students usually meet once or twice a week with an average of 1 hour and half per week and go over questions about Korean culture or discussions about things that both are interested in at the SUB. They learned something new every meeting. Their partner taught those many useful Korean phrases that they have not learned from the class along with many other interesting cultural facts about Korea. All of students agreed that language exchange activity is very helpful. Having a partner to practice foreign language on a weekly basis really helps improving speaking and listening skills.

As a result, all students feel this meeting is helpful and like to meet with their partners to share their culture. This activity allowed them to learn to improve the speaking and reasoning skills. They think using instant messenger is missing oral communication and not helpful for improving language skills. The instant messenger is only for setting up the meeting with their partners and getting instant feedback from their language partner.

CONCLUSION

The tutoring attendees use instant messengers mostly for simple questions or making appointments rather than learning. Therefore, it is crucial to find other methods for effective learning through instant messengering. For example, a native speaker can send a word of the day to students on daily basis, use the voice recording feature in the messenger to practice the correct pronunciation of words, send videos of teaching the right orders of vowels and consonants through the message, use video call feature to exchange language if the partner lives abroad, and more. Language exchange has to be done voluntarily by students. Learning steps for the language exchange have been suggested before. However, it was not followed by any of the students and some students have forgotten about it completely. It is determined that it is unnecessary to give students instructions in exchanging languages. Everyone's different learning styles have to be respected. It will be more practical to observe what kind of cultures and grammars the attendees are learning through the language exchange. It can be done by looking into journals and interviews. This study showed the positive impacts of language exchange for students. However, the utilization of KakaoTalk in language exchange failed to show its full capacity in this field of study. Considering the good potential of KakaoTalk in Language exchange, the use of KakaoTalk for educational purposes can be a good research subject for future studies.

REFERENCES

Androutsopoulos, J. (2006). Introduction: Sociolinguistics and computer-mediated communication. *Journal of Sociolinguistics*, 10, 419–438.

Baron, N. (2008). *Always on: Language in an online and mobile world*. Oxford: Oxford University Press.

Barson, J. Frommer, J., & Schwartz, M. (1992). Foreign language learning using e-mail in a task-oriented perspective: Interuniversity experiments in communication and collaboration. *Journal of Science Education and Technology,* 2(4), 565-584.

Butgereit, L., & Botha, A. (2009). The noisy way to practice spelling vocabulary using a cell phone. In P. Cunningham and M. Cunningham (Eds.), IST-Africa 2009 Conference Proceedings, (pp.1–7). Kampala, Uganda: International Information Management Corporation.

Castells, M. (2007). Communication, power and counter-power in the network society. *International journal of communication*, *1*(1), 29.

Cavus, N., & Ibrahim, D. (2009). m-Learning: An experiment in using SMS to support learning new English language words. British Journal of Educational Technology, 40(1), 78–91.

Chang, C-K., & Hsu, C-K. (2011). A mobile-assisted synchronously collaborative translation–annotation system for English as a foreign language (EFL) reading comprehension. *The Journal of Computer Assisted Language Learning*, 24(2), 155–180.

Chen, C-M., & Chung, C-J. (2008). Personalized mobile English vocabulary learning system based on item response theory and learning memory cycle. *Computers and Education*, 51, 624–645.

Chinnery, G. M. (2006). Emerging technologies Going to the MALL: Mobile-Assisted Language Learning. *Language Learning & Technology*, 10(1), 9-16.

Chun, D. M. (2008, August-September). Integrating research results into the design and development of CALL materials. *Practice-base and practice-oriented CALL research: Proceedings of the 13th International CALL Conference*. Antwerp, Belgium: Linguapolis.

Comas-Quinn, A., & Mardomingo, R. (2009). Mobile blogs in language learning: Making the most of informal and situated learning opportunities. *ReCALL*, 21(1), 96–112.

Crystal, D. (2001). Language and the Internet. Cambridge: Cambridge University Press

Cziko, G. A. (2004). Electronic Tandem Language Learning (eTandem): A Third Approach to Second Language Learning for the 21st Century. *Calico Journal*, 25-39.

Demouy, V., & Kukulska-Hulme, A. (2010). On the spot: Using mobile devices for listening and speaking practice on a French language programme. The Journal of Open Distance and e-Learning, 25(3), 217–232.

Eisenstadt, M.m Komzak, J., & Dzbor, M. (2003, May). Instant messaging+maps= powerful collaboration tools for distance learning. In *Proceedings of TelEduc03*, Havana, Cuba, 2003.
Engwall, O., & Balter, O. (2007). Pronunciation feedback from real and virtual language teachers. *Computer Assisted Language Learning*, *20*, 235-262.
Facer, K. (2004). 'Foreword to the Literature in Mobile Technologies and Learning', in: Naismith et al. (eds), *Futurelab report 11*. Accessed 27th August 2007 from: http://www.Futurelab.org.uk/resources/documents/lit_reviews/Mobile_Review.pdf
Gee, J. P. (2005). *Why video games are good for your soul*. Sydney, Australia: Common Ground
Godwin-Jones, R. (2005). Emerging technologies: Messaging, gaming, peer-to-peer sharing: Language learning strategies & tools for the millennial generation. *Language learning & technology*, *9*(1), 17-22.
Kennedy, C., & Levy, M. (2008). L'italiano al telefonino: Using SMS to support beginners' language learning. *ReCALL*, 20(3), 315–330.
Kim, H., & Kwon, Y. (2012). Exploring smartphone applications for effective mobile-assisted language learning. *Mobile-Assisted Language Learning*, *15*(1), 35.
Kukulaska-Hulme, A., & Shield, L. (2007, September). An Overview of Mobile Assisted Language Learning: can mobile devices support collaborative practice in speaking and listening. In *conference EuroCALL'07 Conference Virtual Strand*.
Kukulska-Hulme, A. & Shield, L. (2008). An overview of mobile-assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL*, 20(3), 271 –289.
Kukulska-Hulme, A., Traxler, J. & Pettit, J. (2007). 'Designed and User-generated Activity in the Mobile Age', *Journal of Learning Design*, 2 (1), pp. 52-65.
Lankshear, C., & Knobel, M. (2007). Sampling the "new" in new literacies. In M. Knobel & C. Lankshear (Eds.), *A new literacies sampler* (pp. 1-24). New York: Peter Lang.
Lee, L. (2004). Learners' perspectives on networked collaborative interaction with native speakers of Spanish in the US. *Language Learning & Technology*, *8*(1), 83-100.
Levy, M. (1997). *Computer-assisted language learning: Context and conceptualization.* Oxford: Oxford University Press.
Levy, M. (2009). Technologies in use for second language learning. *The Modern Language Journal*, 93(s1), 769-782.
Lu, M. (2008). Effectiveness of vocabulary learning via mobile phone. *Journal of Computer Assisted Learning*, 24(6), 515–525.
New London Group (1996). A pedagogy of multiliteracies. *Harvard Educational Review*, 66(1), 60-92.
Pincas, A. (2004). Using mobile support for use of Greek during the Olympic Games 2004. *In Proceedings of M-Learn Conference 2004*. Rome, Italy: Learning and Skills Development Agency.
Schollmeier, R. (2001, August). [16] A Definition of Peer-to-Peer Networking for the Classification of Peer-to-Peer Architectures and Applications. In *p2p* (p. 0101). IEEE.
Stockwell, G. (2007), a review of technology choice for teaching language skills in areas in the CALL literature. *ReCALL Journal*, 19(2), 105-120.
Stockwell, G. (2008). Investigating learner preparedness for and usage patterns of mobile learning. *ReCALL*, 20(3), 253–270.
Stockwell, G. (2010). Using mobile phones for vocabulary activities: Examining the effect of the platform. *Language Learning & Technology*, 14(2), 95–110. Retrieved from: http://llt.msu.edu/vol14num2/stockwell.pdf
Thorne, S. L., Black, R. W., & Sykes, J. M. (2009). Second language use, socialization, and learning in Internet interest communities and online gaming. *The Modern Language Journal*, *93*(s1), 802-821.
Thornton, P., & Houser, C. (2005). Using mobile phones in English education in Japan. *Journal of Computer Assisted Learning*, 21, 217–228.
Thurlow, C, & McKay, S. (2003). Profiling "new" communication technologies in adolescence. *Journal of Language and Social Psychology*, 22, 94-103.
Wang, S., & Smith, S. (2013). Reading and grammar learning through mobile phones. *Language Learning & Technology*, *17*(3), 117-134.
Warschauer, M., Turbee, L., & Roberts, B. (1996). Computer learning networks and student empowerment. *System*, 24(1), 1-14.
Yamaguchi, T. (2005). *Vocabulary learning with a mobile phone*. Program of the 10th Anniversary Conference of Pan-Pacific Association of Applied Linguistics. Edinburgh, UK.