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A Systematic Review on Mobile Learning in Higher Education: The African Perspective

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ABSTRACT
The spread and popularity of mobile devices has led to their increased application in higher education. While studies have reviewed mobile learning initiatives in different contexts, none has explored this subject in Africa. This systematic review collates and compares studies published between 2010 and 2016 on mobile learning in higher education in the African context to explore the application, impact and challenges of mobile technology-supported learning. Findings show that mobile learning within higher education institutions in Africa increased student and lecturer collaboration and, provide dinstant communication, increased student participation and engagement, facilitating authentic learning and reflective practice, as well as fostering learning communities. A change in the lecturers' approaches to teaching also occurred. The findings also indicate significant challenges in integrating mobile learning in higher education institutions within Africa: poor technological infrastructure, lack of access to modern mobile devices, lack of mobile learning pedagogical skills among lecturers, poor attitudes among students and lecturers, and incompatibility of mobile devices with the university online management systems. Policies to guide the implementation of mobile learning were also lacking.

Large-scale studies assessing the effectiveness of mobile learning within African higher education institutions are lacking and existing studies lacked a theoretical framework. The review highlights enabling conditions for successful integration of mobile learning in African institutions addressing access, training, curriculum design, support and technical requirements. The absence of studies reporting on existing mobile learning projects reflects the limited penetration of this technology and associated pedagogies and a need to strengthen research in this emerging field.

Keywords: Mobile technologies, mobile devices, mobile learning, educational technology, Africa, developing countries.

INTRODUCTION
Higher education plays a major role in the economic development of a society. It provides advanced skills, which enable high productivity and improved quality of life (UNDP, 2012; World Bank, 2000), which is why the developed world prioritises higher education for advanced skills that command a premium in today's workplace (UNESCO, 2011). For example, in the USA, human capital is perceived to be three times more important than physical capital (ISI, 2009). However, despite its importance, access to higher education in the developing countries and Sub-Saharan Africa in particular remains very low as compared to its developed counter-parts. According to UNESCO and OECD statistics, developed countries such as Australia, UK and USA, the enrolment in higher education stands at >50% while that of developing countries such as Uganda is <5% (UNESCO, 2011). These figures suggest that the developing countries need to employ appropriate strategies to increase higher education enrolments, to become equal players in the competitive global knowledge economy. If this is not done, they face a future of increasing exclusion from the rest of the world because they lack the necessary skills needed in the 21st century.

The recent findings on the spread and subscription to mobile phones report a tremendous growth and penetration of mobile devices in both developed and developing countries (Johnson, Onwuegbuzie, Turner, 2015). For example, countries such as China and the USA, 97% and 90% respectively of adults own a cell phone with 64% being smart phones. In wealthier countries in the developing world such as South Africa, 89% of people own a mobile device. In contrast, countries in the most impoverished region of Sub-Saharan Africa such as Kenya and Uganda stand at 83% and 65% mobile ownership respectively, with an estimated increase of 130 million new mobile users each year in the developing world (Johnson, et al., 2015; Pew research, 2014).A study by

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Message from the Editor-in-Chief

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TOJET welcomes you. TOJET looks for academic articles on the issues of educational technology and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should discuss the perspectives of students, teachers, school administrators and communities. TOJET contributes to the development of both theory and practice in the field of educational technology. TOJET accepts academically robust papers, topical articles and case studies that contribute to the area of research in educational technology.

The aim of TOJET is to help students, teachers, school administrators and communities better understand how to use technology for learning and teaching activities. The submitted articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET. It provides perspectives on topics relevant to the study, implementation and management of learning with technology.

This journal was initiated in October 2002 to share knowledge with researchers, innovators, practitioners and administrators of education. We are delighted that a lot of researchers, practitioners, administrators, educators, teachers, parents, and students from around the world had visited all issues. TOJET has diffused successfully innovation on educational technology around the world. We hope that this volume seven issue two will also successfully accomplish our global educational goal.

TOJET, AECT, TASET, Sakarya University and Governor State University will organize International Educational Technology Conference (IETC 2017) (www.iet-c.net) in August, 2017 at Harvard University Campus in Boston, USA.

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January 01, 2017

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eTransform ranks Africa as the second fastest growing region in mobile penetration with 650 million mobile subscribers, which is more than in the USA or European Union (World Bank, 2012).

Based on this evidence, there is considerable interest in utilising the availability of these technologies to increase access to higher education particularly in Sub-Saharan Africa (Naismith, 2008).This is because mobile learning that utilises mobile devices is one of the approaches that provide great promise to increase access to higher education within developing countries (Davison & Lazaros, 2015; Maleko Munguatosha, Muyinda, Lubega, 2011; Mansureh, 2010).

Mobile technologies are defined as electronic devices that are small enough to fit in a shirt or jacket pocket and these would include devices such as mobile phones, portable digital assistants, (PDAs) and ipods (Mellow, 2005; Yousuf, 2006). Research into the current state indicates thatmobile technologies support the learner in many ways. Their functionality ranges from relatively simple use of SMS texting providing a non-threatening and private availability of on-demand study supportto the more advanced use of mobile and smartphones for pedagogy. Pedagogical functionality includes content delivery, task collaboration and planning, searching for information and assessment and accessing virtual environments such as discussion boards (Caudill, 2007; Davison & Lazaros, 2015).

The other positives of using mobile technologies in higher education include social and emotional presence, as well as pedagogical change where learners are able to learn anytime and anywhere, through mobile learning which has emerged as an innovative learning approach. Mobile learning makes learning more enjoyable, flexible and interactive since learners are not rendered immobile by the restrictions of desktop computer technology or the traditional classroom settings (Conole, 2007; Ishtawaiwa, 2014; Kukulska-Hulme & Traxler, 2007). Moreover, cellular telephones in particular, can enhance and lead to a sense of ambient co-presence and continuous availability (Ishtawaiwa, 2014) among learners.

Just like any other technology, mobile devices have limitations. These can be broadly categorised as infrastructure, policy and perception based. Recent research reports suggest that mobile devices are limited by lack of processing power relative to a laptop or desktop computer, have small screens, low processing speed & storage, short battery life, content and software application challenges (Kukulska-Hulme, 2009). Furthermore, research highlights scarcity of ICT resources, lack of teacher confidence and competence, resistance to change and negative attitudes, (Bingimlas, 2009; Mathevula & Uwizeyimana, 2014). The issue of teacher perceptions is further discussed by Wheeler (2000) who shows that whilst some teachers have passionately integrated technology (such as computers); others have out rightly rejected it. According to Isaacs (2012), the reason for this appears to be the lack of the necessary knowledge, skills and attitude (SKAs) to adapt to the changes. Consequently, the motivation and confidence to integrate MTs in teaching and distance learning could only come from having access to ICT equipment and possessing the required ICT skills (Mikre, 2011, p.12). However, Rodrigo (2011) argues that with the rapid improvement of new mobile products and the advanced functions and numerous applications and accessories available these days, the technical limitations of mobile devices may be a temporary concern.

The Conole et al (2006) study on university students' perceptions of mobile technology use in UK found that, students tend to choose the technology based on the extent to which it improves their learning. Similarly, research done in Australian schools also noted that students report regularly that they would like to be assigned more complex and engaging activities that involve technologies and that such activities should be relevant to their lives. Otherwise, they feel like they are stepping back in time when they go to school especially when education institutions are experimenting with a diverse range of digital tools, and use approaches not always creative or innovative (Essary 2014; Moyle, 2010). This is related to findings by Hwang, Huang, Shadiev, Wu and Chen (2014) who noted that students might feel motivated when using mobile technologies but their educational achievement is still unsatisfactory. This is possibly the reason why some researchers have reported that the effect of mobile technologies on learning has yet to be determined (Brand & Kinash, 2010; Ishtawaiwa, 2014; Mikre, 2011). Some proponents of mobile learning therefore believe that it will only 'come of age' when whole courses can be studied, assessed and learners accredited through mobile devices (Agarwal & Sambamurth, 1997; Sagarmay, 2012). These are arguments that require further exploration since they can possibly be critical factors constraining the application of mobile technologies in developing country contexts. Further, teachers' perceptions are a key challenge in integrating mobile technologies. According to Kukulska-Hulme (2014), emerging technologies pose many practical and ethical challenges to educators. Recent research reports that, some educators see mobile technologies as disruptive tools that are not useful and increase distraction from learning (Gong & Wallace, 2012; UNESCO, 2012). Given such challenges on mobile technology use, its

application in higher education especially in the developing world remains problematic despite their adoption being a continuous trend.

Even though mobile learning is a relatively new field of study, some systematic reviews have been conducted in this area.These includea major review by Crompton, Burke, Gregory and Grabe (2016) which looked at the use of mobile learning in science and found that mobile devices in science education were popular especially in the area of life sciences and in informal and elementary settings. The study also notes that most studies focused on designing mobile learning systems, while others evaluated the effects of mobile learning. Frohberg, Goth and Schwabe (2009) conducted another key study. They reviewed studies between 2002 when the first mobile learning conference took place and 2007. Results showed that few mobile learning projects incorporated a socialising component. They also report that communication and collaboration through mobile phones played a small role in mobile learning projects. Other reviews have been conducted by Baran (2014) focusing on mobile learning in teacher education, Duman, Orhon and Gedik (2015) on characteristics and research trends of MALL studies between 2000 and 2012, Burston (2014) reviewing MALL publications of studies with statistically reliable measures. Wu, Chen, Chen, Kao, Lin and Huang (2012), studied the trends of MALL studies published between 2007 and 2012. Similarly, Nguyen, Barton and Nguyen (2015), reviewed current research using iPads in higher education where results showed that iPads improved the learning experience but without significant better learning outcomes. These studies provide a broad picture of the current trends in mobile learning in education. However, none provides a detailed analysis of mobile learning in an African context, which is the focus of this study. Therefore, in an exploratory approach, this study reviews empirical evidence of the use of mobile learning in higher education from the perspective of African countries.

PURPOSE

The purpose of this systematic review is to analyse published studies focusing on mobile learning in higher education within Africa between 2010 and 2016. This is to understand the use and adoption of mobile technologies, characteristics of the studies in form of research approaches and methods, theoretical frameworks, mobile devices used as well as results in the form of challenges and teachers and students' perceptions towards integration of mobile learning within higher education institutions in Africa. This is the first of its kind to bring together studies focusing on this subject within Africa. The aim is to provide key insights to higher education policy makers and practitioners to assist in the design of appropriate educational programs and policies that support such technologies in higher education classrooms in the context of Africa. In addition, the findings of this study could provide the basis for further research on mobile learning in higher education within Africa and other developing regions.

Four questions drive this systematic review of mobile learning in African higher education:

1. What methodologies, theoretical frameworks, research types and countries dominate mobile learning studies in African higher education context?
2. How are mobile devices used for mobile learning in African higher education institutions?
3. What are lecturers and students' perceptions of mobile learning in higher education institutions in Africa?
4. What challenge sare associated with the integration of mobile learning within higher education in Africa?

METHODOLOGY

In order to produce unbiased and a comprehensive set of findings, systematic reviews make use of an explicit search strategy to guide the inclusion and exclusion of studies in a review (EPPI, 2010). A systematic review is defined as a piece of research guided by an explicit and transparent set of methods and stages with the potential to be replicated and updated (EPPI, 2016). In this study, relevant papers were identified using the guidelines by the EPPI centre. These included (1) scoping the review which involved developing the inclusion and exclusion criteria, (2) searching and screening studies where the two members of the research team searched for all relevant studies in line with the study criteria,(3)describing and mapping where results were grouped as per the relevant categories (*see appendix i*). Other stages included (4), quality and relevance appraisal by checking the usefulness and credibility of studies to answer the set study questions. At this stage, both researchers were involved in extracting and crosschecking the data. The next stage was (5) synthesizing study findings where the included studies were described and analyzed which provided a good picture of the current state of mobile learning in African higher education. The last stage was (6) drawing conclusions and recommendations. This stage provided the basis to make recommendations for future policy and practice of mobile learning in higher education within African context (EPPI, 2010).

SEARCH STRATEGY

The literature search was conducted through electronic search of databases and institutional databases. Further searching was also done based on the reference lists provided by some selected articles. This was to ensure a more exhaustive scope and to reduce the risk of bias. Due to the limited number of studies on mobile learning and higher education in Africa, peer reviewed, and conference proceedings articles based on empirical evidence were included. The electronic data bases searched include, Web of science, A+Education, ERIC as well as general internet search engines such as Google scholar. These were deemed appropriate because, they are the most popular databases in the discipline of education, under which the study belongs. Moreover, authors had free full access to all these databases. The institutional data bases searched include, the University of Cape Town, University of Pretoria and University of South Africa repositories. These are among the traditional universities in Africa with a strong research component thus expected to have relevant research in line with the study.

In both electronic and hand searches, free text and thesaurus terms were used to locate all relevant articles (EPPI, 2010). These include 'mobile technologies' and 'higher education' 'Mobile learning in Africa', 'Mobile learning and higher education in Africa' Mobile* OR tablet* OR iPad AND Learning, M-Learning OR Mobile Learning. These terms were used as they are the most frequently used when researching and describing mobile learning. To ensure that no literature was missed, the review team consulted an educational librarian at the University of Adelaide who assisted with checking and exploring all databases using a number of key words, until all available literature was exhausted.

STUDY SELECTION

The initialcombined search of electronic and institutional databases produced423 articles. Further examination of the articles wasdone based ontitles and abstracts from which 80 articles were selected for further analysis. After removing the duplicates and studies that were outside the scope of the study, as at 6September 2016, the original set of primary empirical studies remained 31.

INCLUSION CRITERIA

Table 1. *Inclusion Criteria*

Criterion	Inclusion criteria
Focus	Use of Mobile technologies such as smart phones, tablets, MP3 players and other handheld devices.
Level of Education	Higher education
Geographical spread	Studies should be conducted within Africa
Language	Published in English for easy and quick analysis, given the authors' linguistic background.
Design	Both qualitative and quantitative
Period of Research	Selected studies were published between 2010 and 2016 since this is the period that marked the highest growth in the use of mobile technologies in Africa (Isaacs, 2012).
Research base	The study data was based on empirical evidence

DATA EXTRACTION AND ANALYSIS

Once a study was selected, data were extracted and entered into a table, which was constructed based on the inclusion criteria established. The variables noted from each study included author information, country of study, methodology used, key findings and conclusions made. The other features of data extracted from the articles were framed as per the research questions. Since most of the studies reported qualitative findings, free-text narrative data summary was developed for all studies (EPPI, 2010). The numeric data on the other hand was analysed using the statistical meta-analysis procedure where results from independent studies addressing the same questions were collated (EPPI, 2010). This form of analysis later formed the basis for drawing conclusions and recommendations based on evidence from all the studies described.

RESULTS

From a systematic review of educational research published between 2010 and 2016 on mobile learning in higher Education within Africa, only 31 empirical studies were found and these formed the basis for answering the study questions.

QN 1. WHAT RESEARCH TYPES, METHODS, THEORETICAL FRAMEWORKS AND COUNTRIES DOMINATE MOBILE LEARNING STUDIES FOCUSING ON HIGHER EDUCATION IN AFRICA?
RESEARCH APPROACHES

There were five approaches to research in the reviewed studies. Thirteen studies employed mixed research, which involves the combination of quantitative and qualitative research within the same project to facilitate a full understanding of a research problem (Bryman, 2008). The next most popular approach was quantitative research, which focuses on explaining and interpretation of a problem using numerical data (Muijs, 2010). This approach had six studies. This was followed by case study research, which involves a detailed examination of a single case to gain greater insight of a given phenomenon (Flyvbjerg, 2006). This approach had a total number of five studies. Further, three studies employed descriptive research which studies groups of people without manipulation or looking for any specific relationships/correlations or change of environment (Shields & Rangarajan, 2013). Lastly, qualitative research emphasising use of words rather than figures in the collection and analysis of data (Hennink & Bailey, 2010) also had three studies.

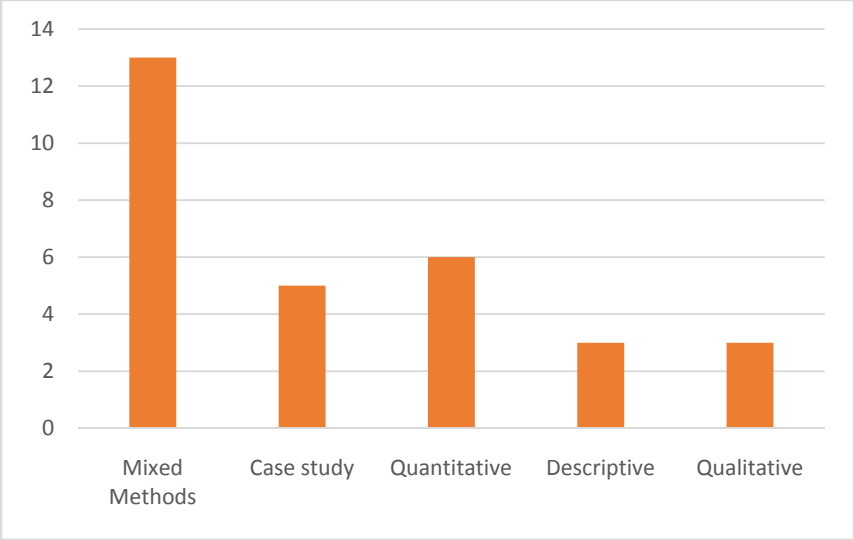

Figure 1. Research approaches

DATA COLLECTION METHODS

The data collection methods included the following:

i) Questionnaire/survey involving a set of questions answered by respondents without the presence of the researcher (Bryman, 2008)
ii) Interviews defined as a conversation between two people (*researcher and participant*) discussing a topic of mutual interest of which the respondent is regarded as an expert (Morris, 2015)
iii) Focus group discussion which is an interview with a number of people focusing on a specific area of topic of interest to the researcher (Smith, 2007)
iv) Observation which is a tool used to systematically observe the behaviour of study participants following a defined schedule of categories (Bryman, 2008)
v) Literature review/content analysis, which involves the analysis of documents and texts following a predetermined category (Tracy, 2013).

The results indicated that26of the reviewed studies used questionnaire as their instrument, 13 used interviews, 4 employed focus groups, three were literature reviews/content analysis while observation was used in two studies. Table 2 illustrates these figures.

Table 2.*Distribution of Data Collection Methods*

Method	Frequency
Questionnaire	26
Interviews	13
Focus groups	4
Literature review	3
Observation	2

THEORETICAL FRAMEWORKS USED IN MOBILE LEARNING STUDIES IN AFRICA

The study investigated the theoretical frameworks commonly used in mobile learning studies in African higher education. In total, 14 out of 31 studies were based on a framework while 17did not have any clear theoretical framework. Most of the frameworks used relate directly to technology adoption and acceptance while others are based on learning theories such as social learning and constructivism. The frameworks include a Bourdieu-based framework, Davis's technology acceptance, Reeves and Oliver's nine characteristics of authentic learning, the Unified Theory of Acceptance and Use of Technology, Czerniewicz & Brown's framework of access to ICT, Framework for the Rational Analysis of Mobile Education (FRAME), Roger's Diffusion of Innovations (2003) and Social Learning Constructivist theory. The technology acceptance model was the most used being represented in a total of 5studies.

COUNTRIES OF RESEARCH

Out of the reviewed studies, South Africa is the country that emerged with the highest number of studies (11), followed by Nigeria (five), Tanzania, Kenya and Uganda each had (three) studies, Ghana and Botswana (two) while Mozambique, Zanzibar and Egypt were each represented by one study. Overall, 11 countries out of the 54 African countries were represented in the research.

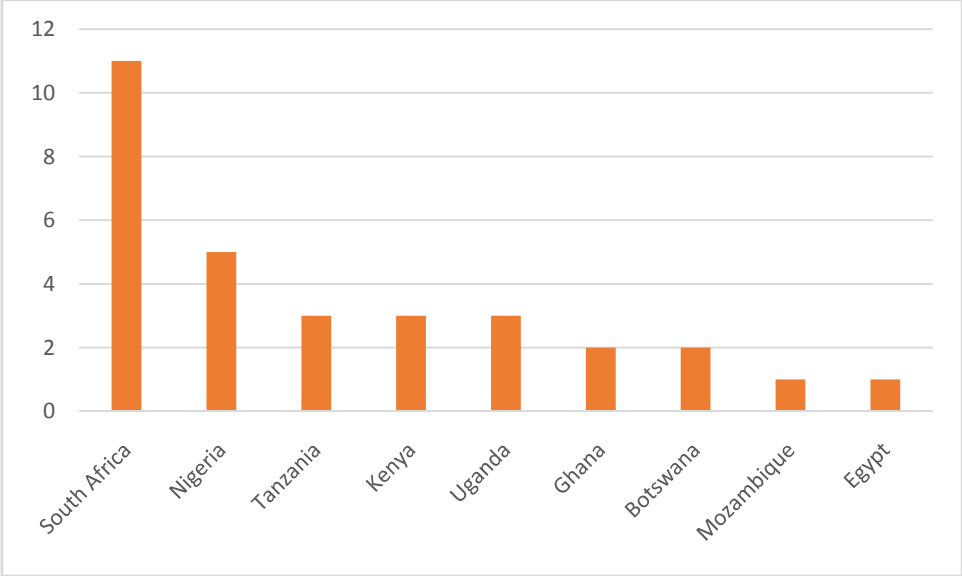

Figure 2. Distribution of studies by country

QUESTION 2: USE OF MOBILE DEVICES FOR MOBILE LEARNING

To explore this question, the researchers started with exploring the most common mobile devices used by students and teachers in higher education within an African context. The results showed that, mobile phones (both smart and normal cellular phones) were the most common mobile devices used by students and lecturers for mobile learning purposes. These were reported in 24 studies. Four studies used tablets while three other studies did not specify the specific devices used.

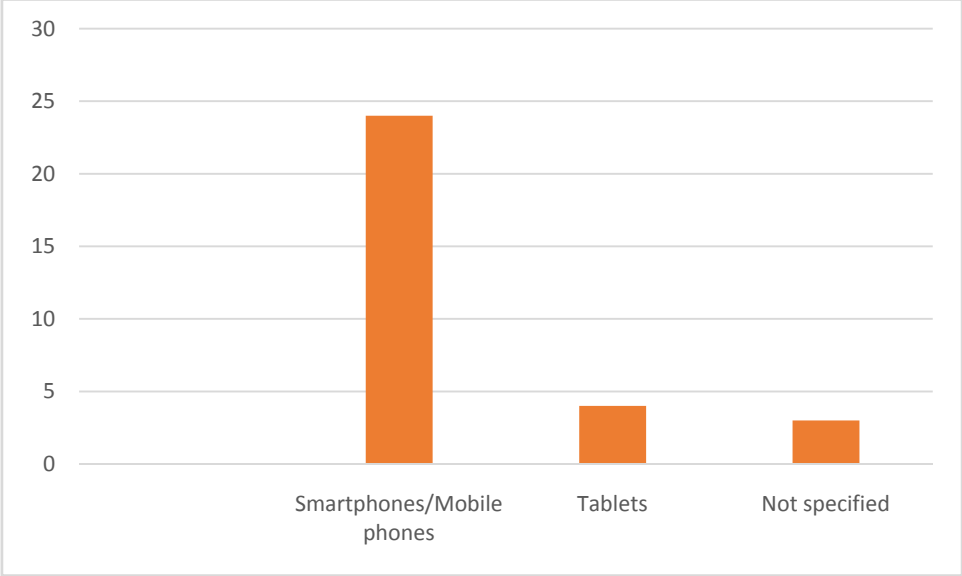

Figure 3. Mobile devices used for mobile learning

The study went further to analyse how such devices are used for mobile learning and whether they have any impact onstudents' learning in higher education institutions. In the review, 10 studies dealt with this area. These include Asiimwe and Grönlund, 2015; Bozalek, Ng'ambi and Gachago, 2013; Mayisela, 2013; Rambeand Bere, 2013;Wanja, 2014; Akeriwa,Penzhorn and Holmner, 2015; Utuluand Alonge, 2012; Mtega, Bernard, Msungu and Sanave, 2012, Pimmer,Brysiewicz, Linxen, Walters, Chipps and Grohbiel, 2014; Annan, Ofori-Dwumfuo and Falch, 2014and Witt, Kebaetse, Holmes, Ryan, Ketshogiteng, Cynthia and Nkomazana, 2016). These studies generally focused on how mobile devices such as mobile phones and tablets can enhance learning in higher education as compared to other traditional approaches. For example, Annan et al., 2014, focused on a one-year mobile learning pilot project where a mobile learning tool (AD-CONNECT) was introduced in 44 courses at the Central University in Ghana.Overall, across the discipline areas and different universities where research was carried out, the results suggest that mobile devices can support student learning in higher education contexts. From the analysis,five major categories of the uses of mobile devices were reported. These included enhanced collaboration between students and lecturers, instant communication, cost effectiveness and portability,flexibility and supporting authentic learning and self-directed learning.For example, students at Makerere University in Uganda and the Open University of Nigeria, reported mobile devices as being cheap and giving them greater control over their learning and increased access to course material (Asiimwe & Grönlund, 2015; Osang,Ngole, Tsuma, 2013). This is further supported by findings from the study at a South African University in a blended learning course, which reported that students with access to mobile technology had an increased opportunity to access the courseware of the blended learning course. Moreover, the same study found that mobile technologies enhanced student-to-student and student-to-lecturer communication especially withsocial networks through use of mobile applications such as Facebook, WhatsApp, twitter among others (Mayisela, 2013; Mansour, 2016). This finding is also shared with other studies by Bozalek, Gachago, Alexander, Watters, Wood, Ivala and Herrington, 2013;Kriek, 2011; Witt, et al., 2016, which reported mobile devices as useful in providing continued access to information and opportunities for communication as well as increasing student engagement since students reported to enjoy classes where mobile technologies were integrated. Mobile devices were also found to increase student participation, foster learning communities and facilitate a gradual change in the lecturer's approach to teaching (Rambe &Bere, 2013).Moreover, in their mobile learning pilot project at Central University College in Ghana, Annan et al (2014) found that mobile learning enhanced collaboration between lecturers and students. This was achieved through lecturers sending course materials such as notes to students and getting instant feedback, tracking students understanding of lessons taught, delivering assignments, conducting polls and surveys, instant examination results and helping students to revise before coming for lectures (Annan,et al., 2014).The other uses reported by studies include use of mobile devices to create, upload, download and listen to stored files as well as facilitating authentic learning, self-directed learning and reflective practice (Adedoja & Oluleye, 2013; Chang, Ghose, Littman-Quinn, Anolik, Kyer, Mazhani and Kovarik, 2012b; Mtega, 2012;Mansour, 2016;Pimmer, et al., 2014). In addition, in Nigeria, during a program for undergraduate students engaged in problem-based learning in three randomly selected private universities, it was revealed that mobile phones can strengthen Problem Based Learning (PBL) in higher institutions and can be used to implement information services provided for students in their university (Utulu & Alonge, 2012).In Zanzibar, mobile learning was reported as key to promoting student motivation and increased engagement (Haji, Shaame &

Kombo, 2013) whileGachago et al (2015) found that use of mobile applications such as WhatsApp increase immediacy and connection between students and teachers.

QUESTION 3: LECTURERS AND STUDENTS' PERCEPTIONS

The study also sought to understand the students and lecturers' perceptions of mobile learning in higher education. The results showed contrasting feelings between students and lecturers on the use of mobile learning in university learning environments. For example, in a study conducted at Makerere University within two courses where Moodle was used as a learning platform, Asiimwe & Gronlund (2015), reported that students had positive attitudes towards the use of mobile phones to access the university learning management systems which enabled them to access learning materials, accomplish learning tasks, communicate and obtain better grades (Mtebe & Raisamo, 2014). With regard to students perceived 'mobile learning acceptance, findings seem to suggest eight key factors that influence the adoption of mobile learning by higher education students in developing countries. These include performance expectancy, facilitating conditions, environmental factors, technological, organisational, individual, social influence, access, nature of the institution's leadership and effort expectancy (Chang, Mwanika, Kaye, Muhwezi, Nabirye, Mbalinda, Burnham, 2012b). The findings further show that students are willing to use and adopt mobile devices and applications for learning purposes if they are made easy to use especially through providing bigger screens, key boards and high processing power (Mtebe & Raisamo, 2014; Macharia & Pelser, 2014; Wang, 2016).Another important finding regarding access was that some students in higher education institutions reported having adequate knowledge and resources to use mobile devices for learning purposes (Mtebe & Raisamo, 2014).

On the other hand, the study findings showed some perceived concerns among lecturers affecting their use of mobile devices for teaching purposes. For example, in a study conducted among Nigerian lecturers, Shonola and Joy (2014) found that lecturers were concerned about their privacy and feared that confidential information would be exposed to students in the process of undertaking mobile learning activities. They also reported that they feared that the quality of their content would be compromised by the use of mobile learning (Shonola & Joy, 2014). Even where lecturers possessed mobile phones as in the case of lecturers at Mt Kenya University, they did not use them for mobile learning due to the negative attitudes they held towards mobile devices(Wanja, 2014).

QUESTION 4: CHALLENGES ASSOCIATED WITH MOBILE LEARNING

From the reviewed studies, there is reasonable evidence that African higher education institutions face considerable challenges in implementing mobile learning. The main constraints mentioned by the studies arecentred on issues such as poor technological infrastructure leading to internet access problems, lack of access to modern mobile devices, lack of mobile learning pedagogical skills and thepoor attitude among some lecturers and institutional leaders towards mobile learning. For example, in a study conducted at Makerere University in Uganda to find out the experience of students using the university online learning management system through their devices, Asiimwe and Gronlund (2015) found that 53% of the respondents noted that it was frustrating for them to use and operate the learning management system on mobile phones. This was because they found it hard to understand the best way to use the system using mobile phones, noting that mastering the system required much effort. South African students who participated in a blended learning course that required them to use mobile devices to access the university learning system reported similar challenges. These reported that using mobile devices was very slow especially in loading pages because it needed a large memory, which was lacking in most phones owned by students. They also reported high cost of the internet, limited access to learning materials, as well as the incompatibility of university learning management systems with mobile phones and other mobile devices (Mayisela, 2013). The problem of high costs was further explored in a study conducted at Sokoine University in Tanzania, where students and teachers reported using their VISA cards to purchase online applications, which they needed for learning purposes, as well as paying a lot of money daily for internet access to allow them to download learning content (Mtega, et al., 2012).

Moreover, mobile learning was reported to be distracting in some studies. For example, mature married students were against the idea of using mobile applications such as WhatsApp, saying that this affected their family life especially where fellow students expected them to participate in certain discussions after class hours (Rambe &Bere, 2013).The other reported challenges of mobile devices for learning purposes included network/ bandwidth failures, power shortages, limited knowledge in the use of smart mobile devices, lack of internet enabled/smart mobile devices among both students and lecturers and the absence of policies guiding the use of mobile devices for learning (Adedoja & Oluleye, 2013; Annan, et al, 2014; Haji, et al., 2013; Lwoga, 2012, Muianga,Hanson, Nilsson, Mondlane, Mutimucio and Guambe, 2013; Witt, et al., 2016). In addition, from the educators' perspective, lack of special skills and knowledge to use mobile devices in designing curriculum, assessment, among others affects their intentions to integrate mobile devices in the instructional process. This

according to (Agbatogun, 2013) was reported to be worse in situations where the institutional leaders were hesitant to encourage and support the mobile learning initiatives suggested by the lecturers or the institutions themselves.

DISCUSSION

This section summarises and discusses key findings in line with previous studies. Weaknesses identified from the reviewed studies and recommendations for policy and future research related to mobile learning in higher education within African context are presented.

One of the key research questions addressed by this study was to establish the research types, methods, countries of research and the theoretical frameworks commonly applied in mobile learning studies within higher education institutions in Africa. Emphasis on these features was important in order to understand the way research findings and conclusions are constructed. In this review, mixed methods formed a large percentage of studies (13), followed by quantitative studies (six) and case studies (five). These findings are consistent with Crompton et al (2016) who in their systematic review of mobile learning in Science reported mixed methods and case studies as the most used approaches in the reviewed studies. The use of mixed methods in mobile learning studies is possibly due to the desire by mobile learning researchers to understand this phenomenon frommultiple viewpoints and perspectives (Bryman, 2008) which is well supported by this approach to research (Johnson, et al., 2007). In addition, the big number of case studies could possibly be justified by the fact that mobile learning is an emerging field of research and therefore the boundaries between this concept and its context are not yet evident thus utilising case studies, which focus on a phenomenon within its normal context (Yin, 2003).

In addition, six methods of data collection were reported in the reviewed studies with questionnaires (26) and interviews (13) being the most used. The use of questionnaires is possibly due to its ability to gather data from a large population (Bryman, 2015) compared to other methods such as praxis, content analysis, and observation, given the large population that characterised most of the reviewed studies. For instance, the study by Macharia and Pelser (2014) study had 1800 participants, Maleko Munguatosha et al (2011) had 1588, Chang et al (2012) had 1118, Mtebe and Raisamo (2014) had 823 while Utulu and Alonge (2012) had 750. In addition, Schreiberand Aartun (2011) had 729, Czerniewicz and Brown (2013) 543, Annan et al., (2014) 522, Agbatogun (2013) had 492,while Bozalek et al (2013) had 242 study participants. Based on these figures, therefore, the popularity of questionnaires in the reviewed studies is justifiable. However, the absence of tests as a data collection instrument across all the studies can be regarded as a methodological weakness. This is because, tests are among the most useful tools in educational research and since some studies (Utulu & Alonge, 2012; Wanja, 2014) aimed at assessing student achievement through use of mobile learning, achievement tests would have been used to ensure valid and reliable results.

With regard to theoretical frameworks, 14 out of 31 studies employed a theoretical framework while 17 out of 31studies did not base their research on any framework. The studies employed frameworks such as the Davis technology acceptance framework, Unified Theory of Acceptance and Use of Technology framework, Framework for the Rational Analysis of Mobile Education and Roger's Diffusion of Innovations (2003). This is a strong point within these studies as frameworks provide a basis upon which mobile learning canbe implemented and the possible factors that could affect its progress. For example, the Unified Theory of Acceptance and Use of technology illustrates whether users will be able to accept the new technologies and their ability to deal with it (Venkatesh & Zhang, 2010). However, the 17 studies that did not base their analysis on any framework, their findings and conclusions are questionable. This is because without theory, our interpretation and understanding of the social world could be meaningless (Reeves, Albert, Kuper and Hodges, 2008).

In addition, the geographical distribution of studies showed that 11 of the 31 studies were carried out in South Africa. According to the recent research by Pew Research centre (2015), mobile phones are as common in South Africa as they are in the USA with over 89% owning a mobile phone and the country has a well-developed telecommunication infrastructure as compared to other African countries. This possibly explains the big number of mobile learning projects and studies on mobile learning in this African region. The same results are consistent with Crompton, et al (2016) review of mobile learning in science education, which states that Taiwan which was the most reported country also has one of the most advanced telecommunication networks in Asia. The implication drawn from these findings is that, success of mobile learning largely depends on the presence of a well-developed telecommunication network to support the use of mobile devices, which according to the proponents of the Unified Theory of Acceptance and Use of technology model is an important facilitating condition (Venkatesh & Zhang, 2010) for technology acceptance.

Mobile phones were reported as the main mobile device used for mobile learning in African higher education institutions. This finding correlates with current findings on the proliferation of mobile phones in Africa, which report that Africa is currently the second largest and fastest growing mobile phone market in the world with a penetration rate of 60% (Pew Research centre, 2015). This provides promise that increased access may lead to a paradigm shift through emphasising mobile learning as a supplementary approach of learning within higher education. The study findings generally show that mobile learning in higher education can enhance students' learning. This is through increased collaboration between students and lecturers, instant communication, supporting authentic learning, increased student participation and engagement and supporting authentic learning. Other benefits include downloading, listening to stored files, facilitating authentic learning and reflective practice, as well as fostering learning communities and gradual change in the lecturers' approach to teaching (Asiimwe & Grönlund, 2015; Kriek, 2011;Osang, et al., 2013; Pimmer, et al., 2014; Rambe & Bere, 2013; Witt, et al., 2016).Such findings would suggest that students in African higher education institutions believe that mobile learning is useful for their learning.However, with half of the studies lacking a clear theoretical framework to guide the analysis and interpretation of their results as well as over reliance on students and teachers' perceptions of mobile learning, these results should be viewed with caution.

The reviewed studies provide reasonable evidence that mobile learning in higher education institutions within Africa face a considerable number of challenges. These centreon issues such as poor technological infrastructure leading to internet access problems, lack of access to modern mobile devices, lack of mobile learning pedagogical skills among teachers/ lecturers and poor attitude among students and lecturers. Others are incompatibility of mobile devices with the university online management systems as well as absence of policies to guide the implementation of mobile learning (Adedoja & Oluleye, 2013; Annan, et al., 2014;Haji, et al., 2013; Lwoga, 2012;Mayisela, 2013; Muianga, et al., 2013; Witt, et al., 2016). The challenges mentioned in this study are in harmony with those raised by UNESCO and the Horizon Reports (2014, 2015)on the challenges facing the integration of mobile learning. They identified connectivity, which is restricted in many areas due to the cost of data, poor internet speed, poor quality mobile phones with limited functionalities and small screens among others (Isaacs, 2012). However, Allan, Carbonaro and Buck (2006) argues that even though mobile devices are expensive, they provide a cheaper alternative when compared to other devices such as desktop and laptop computers. It is also important to note that in some of the studies (e.g. Mtega, et al., 2012) a good number of students in higher education within Africa reported having good access to modern devices that are internet enabled. This provides a promising ground within higher education institutions in Africa to revolutionise their education systems through mobile learning.

LIMITATIONS & IDENTIFIED GAPS

A number of gaps were identified in studies focusing on mobile learning in African context. First, a significant number of studies (17) did not base their research on any theoretical framework, which puts the findings and conclusions into question. This is because, theory provides the basis for understanding complex problems, interpreting empirical data, avoiding unorganised collection of accounts, as well as providing a basis for explaining and analysing the way institutions and individuals work (May, 2001; Reeves, et al., 2008; Robert& Sari, 2006; Wacker, 1998). Without theory, our findings on the social world are devoid of meaning (May,2001) which implies that it must be part of the practice of all our research processes (Mills, 1959). The possible reason as to why frameworks are not yet clear is the fact that mobile learning in formal education is still a developing field and therefore methodologies and frameworks are still emerging (Traxler, 2009).Moreover, most of the reviewed studies are small-scale with only one study out of 31 based on a 1-year mobile learning pilot project. However, studies conducted within a very short periodcan be criticized for failing to address some critical issues. This is because there is no adequate time to explore issues in-depth (Cheung & Hew, 2009), establishing causal inferences, change in knowledge and attitudes as well as providing thick descriptions offered by longer term studies such as those applying a longitudinal research approach (Long & Johnson, 2000; Ruskin 2002). Other researchers such as Rajasingham (2011) also noted that most mobile learning studies and scenarios are based on short term and short funded pilot projects.

In terms of the geographical distribution of studies across the African continent, only ten countries out of the 54 making up the continent were represented. South Africa dominated with 11 out of 31 studies while, Nigeria accounted for five out of 31. This means, the rest of the 52 African countries shared 15 studies. This wide disparity in coverage generally shows that research in use of mobile learning in Africa is still very limited more especially among the least developed countries of sub-Saharan Africa. This demonstrates a need for future research and mobile learning projects to focus on this area. Therefore, it is important to note thatthe gaps identified in the reviewed studies have strong implications for policy, practice and research in the area of mobile learning within African context. For instance, the absence of

empirical studies reporting on existing mobile learning projects in higher education institutions in Africa implies that mobile learning has not become mainstream in this context. Therefore, further research in this field is needed to explore its impact as the proliferation of mobile devicesin Africa increases.

CONCLUSION AND SUGGESTIONS FOR FUTURE RESEARCH

The number of studies on mobile learning in higher education is growing rapidly, even though there are still very few high quality studies to provide evidence for its effectiveness. Nonetheless, the study findings seem to suggest a growing interest in the integration and use of mobile learning in Africa's higher education institutions. With the increasing spread of mobile devices, the future of mobile learning in Africa is encouraging. Fo rinstance, the analysis seems to suggest an increasing interest in mobile learning research within Africa. For example, from 2010 to 2011a very limited number of studies (three) were published, while from 2012-2013 research in this area increased at a fast pace with a record number of 15 studies published, while in 2014 to 2016 13studies have been published. The big number of papers published between 2012 and 2014 is in agreement with the findings by the New Horizon Reports (2014, 2015) which noted that there was an increasing trend in mobile learning within developing countries (Isaacs, 2012).This is an encouraging trend showing an increasing interest in researching mobile learning in African higher education.

However, as noted in the discussion section, a few challenges remain which require attention if mobile learning is to be fully integrated within higher education institutions in Africa. First, technical support should be provided to students and teachers on use of mobile technologies, learning management systems need to be designed in a way compatible with mobile devices, training should be provided to course developers and internet access on campuses including student residences, classrooms and library should be improved. This will address some challenges such as the internet costs faced by students (Adedoja, Adelore, Egbokhare and Oluleye, 2013; Mayisela, 2013).

Finally, the study recommends future research to conduct longer and bigger scale studies exploring the impact of mobile learning in higher education in African context sincethe majority of the studies were characterised by short duration. Moreover, studies should utilise the existing mobile learning and other educational technology related frameworks to provide a lens through which study results can be analysed and interpreted. If these issues are addressed, the impact of mobile learning in Africa can be accurately evaluated and study results can be used to design appropriate policies to guide effective mobile learning pedagogies for higher education institutions.

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Appendix: Summary of Reviewed Studies

References	Country	N	Design	Focus	Summary of Findings
Asiimwe & Grönlund (2015)	Uganda	30	Mixed	Investigating use of LCMS on mobile phones at Makerere University in Uganda.	The results show positive attitudes towards use of LCMS on phones but also huge challenges which are content and technical in nature.
Adedoja et al (2013).	Nigeria	201	Mixed	This mobile phones for learning purposes study focused on students' acceptance of	The findings confirm that the mobile tutorials enhanced teaching and learning. Challenges such as network failure and the poor supply of electricity were reported.
Agbatogun (2013).	Nigeria	492	Quantitative	Predicting faculty Member's use of digital technologies in Nigerian Universities.	Some environmental factors motivate and frustrate faculty members' use of digital technologies in the classroom. In addition, gender, academic qualification, academic status, motivating and discouraging factors jointly contributed to the prediction of faculty members' use of digital technologies.
Annan et al (2014).	Ghana	522	Mixed	This study was on a one-year m-learning pilot project at Central University College in Ghana	Mobile learning enhances collaboration between students and lecturers, by lecturers sending their notes to them and getting instant feedback, track students understanding of lessons taught
Akeriwa et al (2015).	Ghana	155	Mixed	Investigating the possibility of using mobile technologies to implement social media based services to graduate students at the University for Development Studies Library in Ghana	A great deal of enthusiasm was expressed in this regard suggesting that, with the necessary infrastructure and technical expertise, there exists a real possibility of delivering library services through mobile devices to graduate students at UDS.
Adeboye & Staden (2015).	South Africa	118	Case study	Identifying the challenges experienced by students in their voyage from e- learning to m-Learning.	The study results identified difficulties involving technical problems, distractions by applications on the mobile devices and issues of health such as eye constraint.
Bozalek et al (2013a).	South Africa	262	Mixed	Surveying the use of emerging technologies among 262 South African higher educators.	Findings show that emerging technologies made the most impact on the attainment of authentic context and authentic tasks.
Bozalek et al (2013b).	South Africa	242	Mixed	Exploring the potential of emerging technologies to disrupt current teaching and learning practices.	Emerging technologies address the challenges of Student-student, student-teacher interactions, communication in and out of class, and provision of feedback to students and enhancing student engagement. Institutional infrastructure (54%) and lecturers' attitudes were stated as major challenges
Chang et al	Uganda	111	Mixed	Internet-based survey on	Internet access in rural educational

(2012a)		8		ICT administered to students, tutors, and faculty members associated with a Community-Based Education and Service (COBES) program in Uganda.	sites is still lacking, but students and educators appear eager to utilize mobile technologies to improve the quality of teaching and learning for COBES participants
Chang et al (2012b).	Botswana	07	Quantitative	The role of smartphone based mLearning with student resident (physicians in specialty training) education.	Smartphones loaded with point-of-care tools are effectively utilized by resident physicians in resource-limited settings, both for accessing point-of-care medical information at the bedside and engaging in self-directed learning at home by the medical students.
Czerniewicz & Brown (2013)	South Africa	543	Case study	Investigating South African students' technological habitus by making a link between computer and mobile use.	The findings showed that cell phones are widely used as a core ICT resource yet under-acknowledged as a medium of learning by universities.
Gachago et al (2015)	South Africa	Not specified	Mixed	This study reflects on how three South African higher educators introduced WhatsApp into their teaching practices	Findings showed that mobile technology assist in increasing immediacy and connection not only in informal, but also in formal blended and open distance learning contexts, facilitating reflection, coordination, identification and, in some cases, with students' control and ownership, transformation.
Haji et al (2013)	Zanzibar	106	Case study	Opportunities and challenges of mobile learning among Higher Learning Students (HLS) in developing countries of Zanzibar context.	Encourages self-motivation and increases engagement. Challenges include high cost of mobile devices, poor physical infrastructure and band width.
Kriek (2011).	South Africa	161	Mixed	Investigating whether a private higher education institution in South Africa is using social media for business or educational purposes.	Mixed feelings about using socially-focused technologies for professional purposes, and that technologies are not yet used to their full potential at the institution. The main challenge is the lack of fixed line internet connectivity.
Lwoga, E. (2012)	Tanzania	06	Qualitative	Assessing use of Web 2.0 technologies in Africa's higher learning institutions, with a specific focus on Tanzania's public universities	Adoption of e-learning and Web 2.0 technologies still in its infancy. Challenges include poor technological infrastructure, high costs of devices, attitudes, lack of local expertise.
Mtebe & Raisamo (2014).	East Africa (Kenya & Tanzania).	823	Survey/ quantitative	The study investigated factors that contribute towards students' adoption and use of mobile learning in East Africa	The results showed that performance expectancy, effort expectancy, social influence, and facilitating conditions had significant positive effects on students' mobile learning acceptance
Mayisela (2013)	South Africa	36	Case study	Establishing how the use of mobile technology	Students with access to mobile technology had an increased

			(mixed)	could enhance accessibility and Communication in a blended learning course.	opportunity to access the courseware, enhanced student-to-student & student-to-lecturer communication by means of social networks.
Macharia & Pelser (2014).	Kenya	1800	Descriptive	This study aimed at understanding factors influencing use of ICT in student learning in 16 Kenyan higher education instns.	Environmental, technological, organizational and individual factors play a significant role in ICT uptake
Muianga et al (2013)	Mozambique	19	Qualitative	This study aimed at providing a description and analysis of the current state of ICT4Education implementation in HEIs in Mozambique	The results show that the country has advanced greatly in terms of design and implementation of ICT policies, as well as telecommunication. Challenges such as bandwidth and access to mobile devices remain problematic
Maleko et al (2011)	Uganda	1588	Mixed	Establishing a model for adopting social networked learning in higher institutions of learning in developing countries of Africa	Adoption of social networked learning requires self efficacy, reliable technical and administrative support, infrastructure, system interactivity, adequate budgeting and accountability, and a flexible organisational culture.
Mtega et al (2012	Tanzania	70	Mixed	The study investigated how mobile phones have been used for teaching and learning purposes in higher learning institutions in Tanzania.	Majority of the respondents used their mobile phones for teaching and learning process. They used SMS. Challenges include costs for downloading content.
Mansour, E. A. (2016).	Egypt	441	Quantitative	Investigating the use patterns and ownership of smart phone apps among students at the South Valley University (SVU), Egypt	The most used apps were Facebook, e-mail, Twitter, WhatsApp, YouTube and Viber. For professional purposes, students used smartphones more for communication purposes than learning purposes
Ng'ambi et al (2012)	South Africa	263	Quantitative	Uses of ET among educators in the context of South African higher education.	Educators in South Africa use a wide range of ET in their teaching and learning
Osang et al (2013	Nigeria	80	Quantitative	This paper discusses the benefits and prospects of implementing mobile learning in Nigeria	The greatest benefits are mobility and delivery of course materials. Challenges include power shortages, security issues, educator's perspectives and low computer literacy
Pimmer et al (2014) .	South Africa	750	Qualitative	Investigating whether nursing students use mobile phones as effective educational tools in marginalized and remote areas.	Mobile phone usage facilitated (1) authentic problem solving; (2) reflective practice; (3) emotional support and belongingness; (4) the realization of unpredictable teaching situations; and (5) life-long learning.

Rambe &Bere (2013)	South Africa	95	Case study	The paper explored using WhatsApp, for an information technology course at a South African university	The findings suggest heightened student participation, the fostering of learning communities for knowledge creation and progressive shifts in the lecturer's mode of pedagogical delivery.
Shonola & Joy (2014).	Nigeria	120	Survey	This paper discusses the security concerns of mobile learning from the lecturers' perspective based on a study conducted in higher Education institutions in Nigeria.	Findings show that lectures felt that their privacy and confidential information being exposed in the course of discharging their duties is a concern unless adequate security measures are in place in m-learning systems.
Schreiber & Aartun (2011).	South Africa	729	Mixed	A pilot study of an online support service via mobile technology using chat facilities at a Higher Education Institution in South Africa.	Results suggest that students utilise online support services and tend to engage easier with an online counsellor compared to a face-to-face counselling intervention
Utulu & Alonge (2012)	Nigeria	750	Quantitative	Evaluating the use of mobile phones by students involved in PBL in three randomly selected private universities in Nigeria	Mobiles phones can be used to strengthen PBL in higher institutions and can be used to implement information services provided for students in their university
Wanja (2014).	Kenya	258	Mixed	Examining the utilization of mobile phones in enhancing learner support services in distance education programmes at Mount Kenya University, in Kenya	Utilisation was ineffective due to attitude and perceptions. In addition, although the information was related to learning, it had insignificant contribution to the entire learning process as a learner support tool.
Witt et al (2016)	Botswana	82	Mixed methods	Use of smart devices (tablets) in undergraduate medical education and medical students' perceptions of the effects on their learning environment.	Tablets were useful in their medical education, allowing them continual access to information and opportunities for communication. Challenges: limited internet access beyond the Wi-Fi zones at the training sites, others' perceptions, security concerns, and technical issues.

Computer Self-Efficacy Among Senior High School Teachers in Ghana and the Functionality of Demographic Variables on their Computer Self-efficacy

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ABSTRACT
The study is aimed at investigating 1) the level of computer self-efficacy among public senior high school (SHS) teachers in Ghana and 2) the functionality of teachers' age, gender, and computer experiences on their computer self-efficacy. Four hundred and Seven (407) SHS teachers were used for the study. The "Computer Self-Efficacy" (CSE) scale, developed by Teo and Koh (2010) was adapted and used for data collection. Descriptive statistics, *t* tests and univariate analyses were employed to analyse the data. The results showed that generally, SHS teachers neither disagree nor agree that they are computer self-efficacious; specifically they agree that they are self-efficacious in basic computer skills but not certain about their self-efficacy in web based skills and not self-efficacious in media related computer skills. Moreover, the results revealed that teachers' age, gender, and computer experiences have similar and dissimilar influences on their computer self-efficacy related to different computer application software. Furthermore, according to the results, teachers' gender and their computer experience have interaction effect on their computer self-efficacy whilst 1) teachers' gender and age and 2) teachers' age and computer experience have no statistically significant interaction effect on their computer self-efficacy. The study provides new and vital information for educational practitioners in Ghana. The findings suggest that xpecting teachers in developing country such as Ghana to teach with technology still remains as a very challenging issue which requires important attention. In addition, the study provides new insights into explanation for contradictory research findings of the effect of (SHS) teachers' age, gender, and computer experience on their computer self-efficacy in the literature.

Keywords: Computer self-efficacy; public senior high school teachers; age; gender; computer experience; demographic variables; interaction effect

INTRODUCTION
Increasingly, computer technology has been and is becoming more powerful tool in all over the world for changing the strategies of teaching and learning in classrooms since its introduction in education in the 1960s and 70s.This has been necessitated by the conceptions of techno-reformers (e.g. Papert, 1980) that computer technology can revolutionalise the educational landscape. Nowadays, computer technology (e.g., the Internet, iPad, MOOCS, 3Ds, blackboard, MOODLE, etc) has become a common tool in many schools and institutions in both developing and developed countries; and are being used to teach all subject areas (Khorrami-Arani, 2001) in different modes including distance teaching and regular teaching. The intention is that computer technology can enhance classroom teaching for development of 21st century competencies.

Almost all the recognised organisations and institutions such as the United Nations (UN), United Nations Educational, Scientific and Cultural Organisation (UNESCO), World Bank, African Development Bank (AfDB), Organisation for Economic Cooperation and Development (OECD) have recognised, and agreed to the assertion that ICT can bring tremendous change in education. For example, United Nations Report (2005) shows the potential of computer technology to expand access to quality education and to improve literacy in developing countries. In this regard, these organisations have been sponsoring, in diverse ways, various projects worldwide aimed at integrating computer into education to promote the development of 21st century competencies. Similarly, as indicated by Buabeng-Andoh (2012), many governments in both developed and developing countries have initiated serious investments in computer technology to improve teaching and learning.

In Ghana, the integration of computer into education began to receive government attention 14 years ago. Many of the stakeholders in Ghana including governments and educational practitioners have the strong belief that introducing computer in education would solve almost all the educational problems in Ghana (Republic of Ghana, 2002; World Bank, 2007). In 2004, the Parliament of Ghana passed into law Ghana's ICT (Information and Communication Technology) for Accelerated Development (ICT4AD) Policy. Among other things the policy requires the use of ICT or computer for teaching and learning at all levels of education. As a result of this policy, ICT courses were introduced in all basic and secondary schools or SHSs in Ghana in 2007. All tertiary institutions in Ghana offer computer technology as a compulsory course. Computer laboratories have been built in almost all the basic and secondary schools (Mereku, Yidana, Hordzi, Tete-Mensah, & Williams, 2009) and teachers have been participated in ICT training workshops to facilitate the successful integration of computer into teaching and learning. However, evidence in the literature (e.g., Gulbahar, 2007; Salomon, 2002; Sarfo & Elen, 2008; Sarfo & Ansong-Gyimah, 2011; Inan & Lowther, 2009) on integration of computer into education show that in spite of the huge investments, ICT implementation in the school systems of many developed and developing countries has not been effective or successful as expected. A study by Mereku et al. (2009) on pedagogical integration of ICT in various basic and secondary schools in Ghana indicates that there is a gap between the policy directives and actual practice.

Successful integration of computer into education in both advanced and developing countries is a highly complex goal for technology reformers and instructional technologists to achieve (Mills & Tincher, 2003). A number of research studies (e.g., Bingimlas, 2009; Ertmer, 2006; Bitner & Bitner, 2002) in the literature identify a long list of factors that potentially encourage or handicap the successful integration of computers in teaching and learning. Some of the factors identified are school related which include poor planning for the use of technology, access to computers and many others. Bitner and Bitner (2002) pointed out that school related factors nonetheless are not the key determinants to the success or failure of computer use in teaching and learning; effective use of computer in the classroom usually lies with the teachers. Wadmany (2011) and other researchers support the assertion that teacher related factors have the most impact on the integration of computer into education. It is the teachers' skills, and self-efficacy beliefs, among others, that determine the choices they make about what, when, where and how to use, and integrate computers into teaching (Bitner & Bitner, 2002). Specifically, teachers' computer self-efficacy or teacher confidence has been hypothesised as having an influence on computer use for classroom teaching (Ertmer, 2006; Aremu & Fasan, 2012). This notwithstanding, there is inconsistent research findings (e.g., Jegede, 2007; Adebowale, Adediwura & Bada, 2009; Aremu &Fusan, 2012; Ebitar, 2015) on the influence of senior secondary school teachers demographic variables on their computer self-efficacy. In the literature, little is known about the interaction effect of teachers' demographic variables on their computer self-efficacy. This makes it problematic for designing and implementation of effective interventions to enhance teacher's confidence and usage of computer in teaching and learning. To contribute to the solution of this problem in both developed and developing countries, the study is designed to examine the functionality and interaction effect of teacher-related-variables such as gender, age, and computer experience on their computer self-efficacy. In addition, Ghana, as a developing country, began the introduction of computer in education not very long ago. Unlike other developed countries, in Ghana few studies (e.g., Sarfo. 2011, Buabeng-Andoh, 2012; Mereku et al., 2009; Sarfo, Amankwah, Oti-Agyen & Yidana, 2016) which have been conducted into integration of computer in education concentrate on computer access and use, gender and computer use, and competencies in computer usage among teachers in senior high schools (SHS) in Ghana. There is lack of empirical study conducted to examine teachers' computer self-efficacy in SHSs in Ghana. With this regard, the present research is also conducted to examine the level of computer self-efficacy among SHS teachers in Ghana. The results of the study will provide scientific knowledge and understanding about the level of computer self-efficacy among SHS (in Ghana). Again, the study will contribute to the understanding of relationships among the factors that impact teachers' computer self-efficacy globally.

Computer self-efficacy

Self-efficacy is defined by Bandura (1994) as "people's beliefs about their capabilities to create designated levels of performance that exercise influence over events that affect their levels of performance" (Bandura, 1994, p 2). Similarly, Kinzie, Delcourt and Powers (1994) defined self-efficacy as an individual's confidence in his or her ability which may impact on the performance of tasks. They further explained that "self-efficacy reflects an individual's confidence in his/her ability to perform the behaviour required to produce specific outcome and to directly impact the choice to engage in a task, as well as the effort that will be expended and the persistence that will be exhibited" (p. 747). Self-efficacy, based on the above, is described as individuals' beliefs or confidence in their capabilities of executing a task to a required level of satisfaction. Self-efficacy beliefs, according to Zimmerman (2000), differ conceptually and psychometrically from related motivational constructs, such as outcome expectation and self-concept.

Self-efficacy has been found to influence choice of whether to engage in a task, the effort expended in performing it and the persistence shown in accomplishing it (Bouffard-Bouchard, 1990). As indicated by Bandura (1994) people with a high sense of efficacy have the will power to cope with the obstacles and setbacks that characterise difficult undertaking. According to Pajares (2002), self-efficacy perception provides individuals with happiness, motivation and a sense of achievement. For Bandura (1986), the greater people perceived their self-efficacy to be, the more active and longer they persisted in their effort. Bandura (1994) proposed that people perceived self-efficacy can be developed by four main sources. These are 1) mastery experiences (combination of cognitive and behavioural tools to create successful action to promote performance), 2) vicarious experiences provided by social models, 3) social persuasion, and 4) physical and emotional states. As a result of the sources, self-efficacy beliefs are studied as indicators of change; they are susceptible to instruction or intervention (Zimmerman, 2000; Bandura, 1994). A research study by Bandura (1997) showed that self-efficacy beliefs are influenced by environmental situations, personal factors, cognitive factors, and demographic factors, such as gender and age**.** People's self-efficacy judgements are measured using questionnaire items that are task specific and vary in difficulty and degree of confidence (Zimmerman, 2000). Self-efficacy questionnaire measures individuals' performance capabilities rather than personal qualities.

Specifically, computer self-efficacy which has been adapted from self-efficacy theory in social cognitive psychology is defined as an individual's judgement of their knowledge and capabilities to use computers in diverse situations (Compeau & Higgins, 1995). Computer self-efficacy is therefore based on beliefs and confidence about what a person can accomplish with the skills and knowledge of computer they already possess. In this study, teachers' computer self-efficacy is focused on SHS teachers beliefs and confidence in using basic computer skills, media related skills and web based skills (Teo & Koh, 2010) to facilitate teaching and learning.
It is generally conceptualised that individuals with high computer self-efficacy will be more willing and likely to learn and do new things using computers (Kinzie**.** Delcourt, & Powers, 1994). Teachers with a high sense of computer self-efficacy will be more capable of using the computer and would have the will power to endure the obstacles and setbacks involved with the use of computers in the classroom to facilitate teaching and learning. Research findings by Compeau and Higgins (1995) showed that teachers with higher computer self-efficacy tend to see themselves as able to use computer technology, however teachers with lower computer self-efficacy become more frustrated and more anxious working with computers. Similarly, according to Ozcelik & Kurt (2007), teachers who are confident in their capabilities of using computers will be more likely to utilise the tools more often in performing classroom tasks. Thus, teachers' computer self-efficacy is a strong determinant in studying teachers' behaviours with respect to the use of computers in teaching and learning (Cassidy & Eachus, 2002).

Teachers' gender and their computer self-efficacy
Similar to gender and ICT usage, the difference between gender and computer self-efficacy has been of great interest in educational technology community. Some of the studies indicated a statistically significant difference between gender and computer self-efficacy**.** For instance, Aremu and Fasan (2012) found gender to be of a significant predictor of teachers' computer self-efficacy. Moreover, Kong, Chai, Tan, Hasbee and Ting (2014) in a study of 102 Malaysian English as Second Language (ESL) teachers discovered that male teachers have a significantly higher computer self-efficacy than their female counterparts. To support this, Ozturk, Bozkurt, Kartal, Demir and Ekici (2011) adopted descriptive survey design to explore prospective science teachers' computer related self-efficacy perceptions in terms of gender. The results indicated that computer related self-efficacy perception scores of teachers differed significantly according to gender. On the contrary, Jegede (2007) found no gender influence on teachers' computer self-efficacy in a study conducted to explore factors that are associated with computer self-efficacy among teachers. Even though most of the studies reported show that males have higher computer self-efficacy than female teachers, the situation is not fully clear in the literature and more especially in the context of SHS teachers in Ghana.

Teachers' age and their computer self-efficacy
According to Bandura (1994) mastery experience is considered as one of the important sources of self-efficacy. Interestingly, with regard to technology (computer) *younger teachers* seem to have more computer experience than *older teachers*. This is because many of the old teachers had their education before the computer age and had less exposure to the computer usage compared to young teachers. The age factor in the use of computer technologies has also been explained in the context of generational differences by Prensky (2001). Prensky (2001) introduced two important concepts of the "Digital natives" and "Digital Immigrants". He therefore labelled the younger generation as the digital natives as they are all *native speakers* of the digital language of computer technologies and people who were born before this new digital era, which started around 1980 (in developed countries) as digital immigrants. He further argued that digital immigrants may learn to use computer technologies but will still be in some discomfort. The implication is that the younger generation (digital natives)

are more likely to have the skills and confidence to use computer technology than the older generation (digital immigrants). A study carried out in Egypt by Ebitar (2015) revealed that age had significant effect on teachers' computer self-efficacy. Additional research findings by Czaja et al. (2006) showed that in general computer users above the age of 65 had low self-efficacy in their ability to use computer than did younger people. However, Awofala, Fatade and Udeani (2015) conducted a study that explored Nigerian pre-service teachers' level of computer self-efficacy, and to determine the invariability of this with respect to the demographic variables such as age, gender and discipline of study. Among others, the results showed that construct of computer self-efficacy appeared invariant with respect to the age classification. In addition, Adebowale et. al (2009) also found age not to be a significant predictor of computer self-efficacy. It is argued, based on the above empirical findings, that the effect of age and computer self-efficacy remains not very clear and requires more empirical investigation in different contexts for clearer understanding and direction.

Teachers ' computer experience and their computer self-efficacy

Computer experience has been defined as the frequency of computer usage for different activities and purposes. Bandura (1994) asserted that experience is particularly influential and recognised as one of the strongest factors that contributes to people's self-efficacy because of its direct and personal nature. Compeau and Higgins (1995) claimed that prior computer experience has been shown to be a key individual difference variable that predicts computer self-efficacy in a variety of computer applications. Bozionelos (2001) research study revealed that when individuals gained more experience with computers, they were less likely to be anxious when dealing with technology. This is reinforced by research findings by Elbitar (2015) that there is statistically significant relationship between teachers' computer experience and their perceived computer self-efficacy. However, Karsten and Roth (1998) investigated the relationships among computer experience, computer self-efficacy and performance in Information Technology courses. Their study revealed that computer experience had no significant influence on computer self-efficacy beliefs.

Current study

From the literature review above, many studies related to computer self-efficacy have been conducted across the world. However, a close look at the review shows that 1) computer self- efficacy among SHS teachers has not been given prominence in the Ghanaian context; 2) there is inconsistent research findings on the influence of (SHS) teachers' age, computer experience, and gender on their computer self efficacy in both developed and developing countries; and 3) specifically the combined effect of teachers' gender, age, and computer experience on teachers' computer self-efficacy, to some enormous extent, has not been systemically investigated in both developed and developing countries. To fill the above identified research gaps in the literature, this study is designed to address the following research questions:

1. What is the level of computer self-efficacy of senior high school teachers in Ghana?
2. What is the effect of teachers' age, gender, and computer experience on their computer self-efficacy?
3. What is the interaction effects of teachers' age, gender and computer experience on their computer self-efficacy?

The findings of the present study would provide new and additional insight, from Ghanaian context, to the literature on computer self-efficacy among senior high school teachers.

METHODS

Descriptive survey design was adopted in this study since it is accurate and deemed appropriate for educational fact-finding (Cohen, Manion & Morrison, 2000).

Participants

The population of this study was all the public senior high school teachers in the Ashanti Region of Ghana. In all, 434 teachers were randomly selected for the study. Questionnaire from 407 respondents were considered valid for the analyses. The composition of the 407 participants was as follows: 229 males and 178 females; 231 were aged between 20 -30 years and 176 were aged 31 years and above; 246 had low computer experience (below five years of working or studying with a computer) and 161 had high computer experience (above five years of working or studying with a computer**)..**

Research instruments and measures

The instrument used for collecting data from the respondents' was questionnaire which was made up of two parts with the first part eliciting information about the respondents' demographic background such as age, gender, computer experience. The second part of the questionnaire was the adapted "Computer Self-Efficacy Scale" developed by Teo and Koh (2010). The Computer Self-Efficacy Scale (CSE) is a twelve-item instrument that consists of three components and was designed to measure specific self-efficacy in using computers. The first

component is the Basic Computer Skills (BCS), which is composed of five items (e.g. I am able to use word processor to create, edit and format documents for specific purposes). The Media Related Skills (MRS) component had four items (e.g. I am able to use graphic editors to create resources for teaching) and the third component of Web Based Skills (WBS) which consisted of three items (e.g. I am able to use conferencing software for collaboration purposes). All the items on the questionnaire were measured on a 5- point Likert scales ranging from (1) strongly disagree to (5) strongly agree. The total score of the twelve items provides the general level of computer self-efficacy. The questionnaire was pilot tested.

Procedure

The questionnaire was pilot tested on a group of SHS teachers (n=45) drawn from four schools outside of the study area. Few issues related to grammar and construction of the items were identified, discussed and worked on. The Cronbach alphas were: 0.742 for basic computer skills, 0.726 for media related skills and 0.756 for web based skills. The Cronbach alpha for the overall CSE was 0.848. According, Straub, Boudreau and Gefen (2004), a reliability coefficient of 0.70 or above is good enough for research purposes. After the pilot study, the questionnaires for the main study were personally administered by the researchers to the teachers in their schools. The participants were given one week to complete the questionnaires. Out of 434 questionnaires administered, 407 were finally retrieved and were found appropriate for the analyses.

Data Analysis

Descriptive statistic, independent sample *t*-test and univariate analysis were conducted to answer the formulated research questions. Since the sample of the study is approximately normal, while interpreting the mean scores for research question one, the researchers adopted the criteria suggested by Scott (1999) as cited in Rajashekhar (2015) together with the mean (M) scores in Table 2. Table 1 highlights the decision rule.

Table 1: Decision Rule

S/N	Mean Score	Interpretation
1	Up to 2.8	Disagree
2	2.9 – 3.2	Neutral or Neither Disagree nor Agree
3	Above – 3.2	Agree

RESULTS

The level of computer self-efficacy of senior high school teachers

The participants' mean scores with the standard deviations on their levels of computer self-efficacy of the three subscales are presented in Table 2.

Table 2: Level of Computer Self-Efficacy Among Teachers

S/N	Subscale/item	Mean	Standard Deviation
	Basic Computer Skills (BCS)	**3.77**	**1.134**
BCS 1	I am able to use word processor to create, edit and format documents for specific purposes.	4.21	1.002
BCS 2	I am able to use the internet to search for information and resources.	3.91	1.061
BCS 3	I am able to use email for communication	3.85	1.083
BCS 4	I am able to use presentation software for classroom delivery.	3.52	1.294
BCS 5	I am able to use spreadsheet to record data, compute simple calculations and represent data in the form of tables and graphs.	3.36	1.230
	Media Related Skills (MRS)	**2.26**	**1.186**
MRS 1	I am able to use graphic editors to create resources for teaching.	2.87	1.347
MRS 2	I am able to use video editing software.	2.33	1.119
MRS 3	I am able to use website editors to create and/or modify web pages.	2.01	1.256
MRS 4	I am able to use animation software to create animations.	1.84	1.021
	Web Based Skills (WBS)	**3.12**	**1.338**
WBS 1	I am able to use conferencing software for collaboration purposes.	3.21	1.331
WBS 2	I am able to use a learning management system to support teaching.	3.16	1.336

WBS 3	I am able to use blogging for personal use.	2.98	1.348
	Overall Computer Self-Efficacy	**3.10**	**1.219**

The overall computer self-efficacy mean score of 3.10 was reported by the participants indicating that generally teachers neither disagree nor agree that they are computer self-efficacious. More specifically, again, teachers neither disagree nor agree (M=3.12, SD= 1.33) that they are computer self-efficacious in web based skills and they disagree (M=2.26, SD=1.18) that they are computer self-efficacious in media related skills. However, teachers agree (M= 3.77, SD=1.13) that they are self-efficacious in basic computer skills.

Teachers' gender, age and computer experience and their computer self-efficacy

Effect of gender on teachers' Computer Self-Efficacy.

Table 3: Reported Level of Computer Self-Efficacy by Gender

Subscale	Gender	N	Mean	SD	df	t	p
Basic Computer Skills	Male	229	3.48	1.336			
	Female	178	3.61	1.269	405	-1.085	.279
Media Related Skills	Male	229	2.51	1.301			
	Female	178	2.53	1.311	405	-.280	.780
Web Based Skills	Male	229	2.85	1.357			
	Female	178	2.59	1.242	405	2.449	.015*
Overall Computer self-efficacy	Male	229	2.95	1.331			
	Female	178	2.91	1.274	405	.191	.849

*significant at 0.05

The *t* independent test analyses revealed no statistically significant difference between overall computer self-efficacy of male and female teachers. Furthermore, in terms of basic computer skills and media related skills subscales, *t* test analyses revealed no significant differences between male and female teachers. However, the independent *t*-test revealed statistically significant difference between web based skills of male and female teachers in relation to their computer self-efficacy (t (405) = 2.449, p = .015) indicating that male teachers possess a higher computer self-efficacy (M=2.85, SD=1.357) with respect to web based skills than their female counterparts (M=2.59, SD=1.242). Table 3 highlights this.

Effect of age on teachers' computer self-efficacy

The results of *t*-test analyses revealed no statistically significant difference between the overall computer self-efficacy of teachers of 20-30 years and those of 31 years and above. In regard to basic computer skills and web based subscales, *t* test analyses found no significant differences respectively in terms of age.

Table 4: statistical scores of teachers' age and their computer self-efficacy

Subscale	Age	N	Mean	SD	df	t	p
Basic Computer Skills	20-30 years	231	3.58	1.317			
	31 yrs and above	176	3.47	1.291	405	.984	.326
Media Related Skills	20 -30 years	231	2.58	1.295			
	31 yrs and above	176	2.43	1.306	405	1.975	.047*
Web Based Skills	20 -30 years	231	2.74	1.283			
	31 yrs and above	176	2.73	1.350	405	1.472	.055
Overall Computer self-efficacy	20 -30 years	231	2.97	1.298			
	31 yrs and above	176	2.88	1.316	405	1.376	.170

*significant at 0.05

In contrast, *t* test analyses depicted statistically significant difference between media related skills of teachers who were aged between 20-30 and those with 31 years and above (t (405) =1.975, p=.047), indicating that teachers aged 20-30 years possess higher media related skills (M=2.58, SD=1.295) regarding computer self-efficacy than those who were aged between 31 years and above (M=2.43, SD=1.306). Table 4 highlights this.

Effect of teachers' Computer Experience on their Computer Self-Efficacy

Table 5 highlights the statistical scores on teachers' computer experience and their computer self-efficacy.

Table 5: Scores on teachers' computer experience and their computer self-efficacy

Subscale	Computer Experience	N	Mean	SD	df	t	p
Basic Computer Skills	Low	246	4.03	1.497			
	High	161	4.18	1.506	405	-1.345	.179
Media Related Skills	Low	246	2.66	1.463			
	High	161	2.87	1.399	405	-2.280	.014*
Web Based Skills	Low	246	3.20	1.484			
	High	161	3.43	1.413	405	-1.993	.047*
Overall Computer self-efficacy	Low	246	3.30	1.481			
	High	161	3.49	1.439	405	-2.952	.004*

*significant at 0.05

The independent sample *t*-test scores showed statistically significant difference between overall computer self-efficacy of teachers with high computer experience and those with low computer experience (t (405) = -2.952, p=.004). This suggests that teachers with high computer experience possess higher overall computer self-efficacy (M=3.49, SD=1.439) than those with low computer experience (M=3.30, SD=1.481). In relative terms, it was found that there was statistically significant difference between media related skills of teachers with high computer experience and those with low computer experience (t (405)=-2.280, p=.014), indicating that teachers with high computer experience have higher media related skills (M=2.87, SD=1.399) than those with low computer experience (M=2.66, SD=1.463). Similarly, there was statistically significant difference between web-based skills of teachers with high computer experience and those with low computer experience (t (405) = -1.993, p=.047). This means that teachers with high computer experience possess higher web-based skills (M=3.43, SD=1.413) than their counterparts with low computer experience (M=3.20, SD=1.484). However, there was no statistically significant difference between basic computer skills of teachers with high computer experience and those with low computer experience.

Interaction effect of teachers' demographic variables on their 'computer self-efficacy
The effect of gender and computer experience on teachers' computer self-efficacy.

Table 6 shows the mean scores of male and female teachers with low and high computer experiences with respect to their computer self-efficacy in general. Univariate analyses of variance revealed that there was an interaction effect between male and female teachers with low computer experience and male and female teachers with high computer experience on their computer self-efficacy [F(2, 403)=.6999, p=.008] (Figure 1) "eta square" = .017.

Table 6: Mean scores of teachers' computer experience, gender and their computer self-efficacy

Computer experience	Gender	Mean	SD	N
	Male	39.95	7.21	122
Low (1-5 years)	Female	41.50	6.85	104
	Total	40.66	7.07	226
	Male	42.19	6.44	107
High (6 years and above)	Female	40.01	7.50	74
	Total	41.30	6.96	181
	Male	40.99	6.93	229
Total	Female	40.88	7.14	178
	Total	40.95	7.02	407

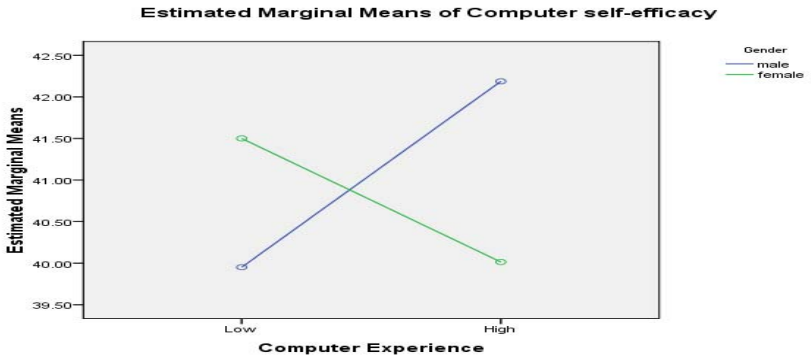

Figure 1: Interaction effects of computer experience and gender

The effect of teachers' computer experience and age on their computer self-efficacy

Univariate analyses revealed no interaction effect on teachers' computer experience and age on their computer self-efficacy. Table 7 and figure 2 highlight this.

Table 7: Scores on teachers' computer experience, age and their computer self-efficacy

Age	Computer Experience	Mean	SD	N
	Low	35.61	8.52	135
20-35 years	High	35.28	8.83	96
	Total	35.47	8.64	231
	Low	34.34	8.69	101
36 years and above	High	34.16	9.47	75
	Total	34.26	9.00	176
	Low	35.06	8.60	236
Total	High	34.79	9.11	171
	Total	34.95	8.81	407

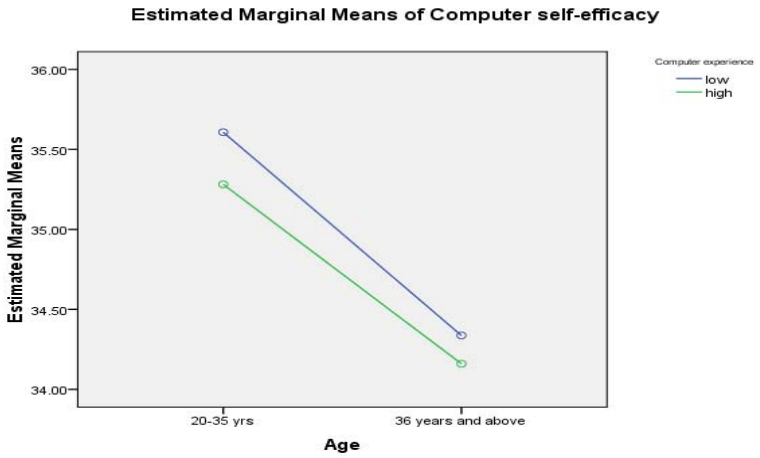

Figure 2: Interaction effects of age and computer experience

Effect of teachers' age and gender on their computer self-efficacy

Univariate analysis revealed no no statistical significant main effects for age and gender on teachers' computer self-efficacy [F (1,402) = .130, p= .719] suggesting no intraction effect. Table 8 and figure 3 highlight this.

Table 8: scores on teachers' age, gender and their computer self-efficacy

Age	Gender	Mean	SD	N
	Male	40.80	6.79	152
20-35 years (young)	Female	41.07	7.21	124
	Total	40.92	6.97	276
	Male	41.39	7.24	77

36 years and above (old)	Female	40.57	7.05	53
	Total	41.05	7.15	130
	Male	40.50	6.93	229
Total	Female	40.92	7.14	177
	Total	40.96	7.02	406

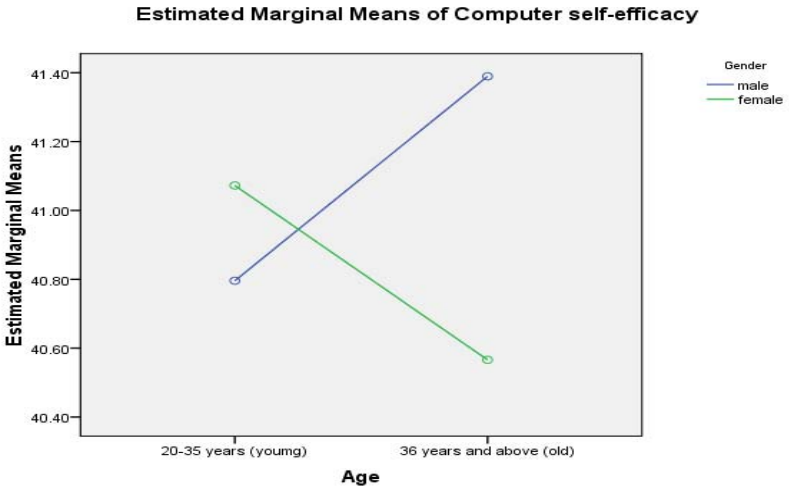

Figure 3: Interaction effects of age and gender

DISCUSSION

This study was conducted to examine the levels of computer self-efficacy among teachers in SHSs. It also aimed at ascertaining the effects of teachers' gender, age, and computer experience on their computer self-efficacy. Moreover, the study was designed to investigate the interaction effects of teachers' gender, age and computer experience on their computer self-efficacy. The result indicated that generally SHS teachers (in Ghana) neither agree nor disagree that they are computer self-efficacious. This implies that SHS teachers in Ghana are not very certain as to whether they have confidence and capabilities in using word processor to create, edit and format documents for teaching and learning purposes; to use the Internet search for information and also use presentation software such as PowerPoint for classroom delivery. This finding, to some extent, is consistent with the findings of previous studies in other countries such as that of Kong et al. (2014), Hasan (2003) and Ozturk et al. 2011) that generally teachers have moderate computer self-efficacy.

However, specifically, according to the findings of the study SHS teachers in Ghana agree that they have computer self-efficacy in basic computer skills (BCS); they are not very certain about their self-efficacy in web based skills (WBS) but they agree that they are not self-efficacious in media related skills (MRS). The finding that SHS teachers in Ghana are self-efficacious in BCS (e.g. word processing, the Internet) is similar to research findings by Sarfo et al. (2016) that SHS teachers have high competencies in word processing applications and internet; the finding is also consistent with Teo and Koh (2010) and Jegede (2007). This finding is not surprising at all since it is expected that teachers would need these basic computer skills (e.g., word processing and e-mail) in their everyday (teaching) work and also for communication purposes. To partially support this, the findings of Sarfo et al. (2016) indicate that SHS teachers have competencies in using the Internet but interestingly they often use internet, specifically e-mail for social communication rather than teaching and learning. Another reason for teachers being self-efficacious BCS is that almost all the teachers have been having training workshops on basic computer skills to facilitate teaching and learning. Teachers (in Ghana) accepting that they are not computer self-efficacious about media related skills as reported in the present study is congruent with research finding by Sarfo et al. (2016) that SHS teachers have low competence level in multimedia software and database application software. This finding could be explained from the point of view that media related software for graphic and video editing, animations and websites editing are more highly complex and expensive specialised tools which are less emphasised in the training of teachers in Ghana. With this regard teachers are more likely to be less efficacious about this aspect of computer self-efficacy.

Generally, the finding of the study also revealed that gender of SHS teachers has no effect on their computer self-efficacy. This suggests that both male and female SHS teachers have similar computer self-efficacy. In addition, there were no significant differences in two categories (BCS and MRS) of computer self-efficacy between male and female SHS teachers. This also indicates that both male and female teachers have similar

computer self-efficacy in relation to basic computer skills and media related skills. These findings support the previous finding of Jegede (2007) that there is no significant difference in teachers' computer self-efficacy with regard to gender. However, the findings are inconsistent with that of Topkaya (2010) and Ozturk et al. (2011). One possible reason for this similarity in computer self-efficacy among males and female teachers is that, female teachers possibly might have realised that they should develop confidence and capabilities in the usage of computer as their male counterparts in order to cope with the new requirements of their profession and also to cope with the emerging technological and knowledge able society. Another reason is that in Ghana, there are several governmental and non-governmental programmes on different platforms to empower females to increase their confidence and self-esteem in science, technology (computer) engineering, and mathematics (STEM). On the contrary, the result of the present study indicates that male teachers have higher computer self-efficacy in WBS than female teachers. This implies that there is gender difference in respect to teachers' computer self-efficacy of WBS in favour of males. This result confirms that of Kong, et al. (2014), Topkaya (2010) and Ozturk et al (2011). But it is important to note that Kong et al. (2011) and other related studies which show gender difference might/do not specify or concentrate (on) respondents' computer self-efficacy in terms of the use of specific computer application software (e.g., BCS, WBS MRS) or tasks.

The study again revealed that there is no difference in *overall* computer self-efficacy between teachers of 20-30 years and those of 31 years and above. Again, the findings of the study show that the age of the teachers does not influence their computer self-efficacy in both BCS and WBS**.** These results suggest that the two categories of teachers in terms of age have similar computer self-efficacy in the use of general computer skills, BCS and WBC. These current findings agree with the findings of Adebowale et al. (2009) who reported that age has nothing to do with computer self-efficacy. But the findings are at variance with previous studies by Elbitar (2015) that younger teachers have high computer self-efficacy than older teachers. In addition, the results of the present study partially do not support the conception of "Digital Native" and "Digital Immigrant" by Prensky (2001). It might be that the old teachers have improved their confidence and capabilities in computer usage through persuasion (Bandura, 1994) and training in order to cope with the new challenges of their profession and 21st century teaching (education) and have therefore become computer efficacious as the younger teachers. In spite of this, specifically, according the findings of the study the younger teachers are more efficacious than the old teachers in terms of the usage of MRS. This particular result supports the findings of Elbitar (2015) and others that younger teachers are more capable and confident in the use of computer in teaching and learning. This finding is in line with the conception of Prensky (2001) on Digital natives and digital immigrants. Based on the present findings (and others), it is argued that the older teachers have the confidence and capabilities in the use of certain computer application software as the younger teachers do but they are not capable of using other complex computer application software (MRS) effectively in teaching and learning as the younger teachers.

In addition, the findings of the present study indicate that the respondents with more computer experience are more efficacious in the general computer skills as well as specific computer skills such as MRS and WBS. Similar findings were established by Elbitar (2015), Hasan (2013) and His-Chi et al. (2010). However, the findings disagree with a previous study by Karsten and Roth (1998) who indicated that computer experience had no significant influence on teachers' computer self-efficacy beliefs. The results of the present study and others (e.g., Elbitar, 2015) that teachers' experience has influence on their computer self-efficacy support the Bandura (1994, 1997) that mastery experience is one of the important sources of self-efficacy. The teachers' more experience (working with computer for 6 years and above) with computer, in this jurisdiction, is considered as desirable and vital in their profession (teaching and learning).

According to the findings of the study, teachers' computer experience has no impact on their computer self-efficacy related to BCS. This finding is consistent with the research claims by Karsten and Roth (1998) that long exposure to computer has no significant influence on computer self-efficacy and usage. One of the reasons that might explain this finding is that many of the training workshops organised for teachers are focused on the acquisition of basic computer skills; and irrespective of their computer experience they need these basic computer skills to cope with their daily teaching work.

The outcome of the study furthermore shows that there is an interaction effect between male and female teachers with low computer experience and male and female teachers with high computer experience on their computer self-efficacy. This implies that SHS teachers' gender and computer experience work together in eliciting teachers' computer self-efficacy. This finding seems new in the global literature on integration of computer into teaching and learning. To some extent, it reveals why there are inconsistent findings of 1) the impact of teachers' computer experience on their computer self-efficacy and 2) the impact of teachers' gender on their computer self-efficacy.

CONCLUSION

The findings that SHS teachers in Ghana generally are not certain about their computer self-efficacy and specifically agree that they are self-efficacious in basic computer skills but not certain about their self-efficacy in web based skills and also not self-efficacious in media related skills are very new, prominent and significant for educational researchers, educational (technology) practitioners or researchers and educational policy-makers (in Ghana). The findings suggest that the teachers are unlikely to use and integrate computers in their teaching and learning in classrooms effectively as expected. This indicates that they need more training and support to develop (full) confidence in computer usage to facilitate teaching and learning. Since teachers agree that they don't have confidence in the use of specific computer software (e.g., MRS), special training or intervention should be organised by policy makers or Ghana Education Service (GES) to address this deficiency.

Furthermore, according to the findings of the study, there are similarities and dissimilarities of confidence and capabilities among 1) male and female teachers, 2) old and younger teachers, and 3) teachers with more computer experience and those with low computer experience in the use of different computer application software. Some of these teacher related factors furthermore work together to produce teachers' confidence and capabilities in the use of the computer**,** one factor cannot be considered without the other. For instance, according to the findings, whether a teacher's computer experience would have impact on his/her confidence and capabilities in using computer in teaching and learning depends on the gender of the teacher. This implies that different and specific interventions and training or instruction should be organised for different categories of teachers to improve their confidence and skills in the use of different computer software effectively in teaching and learning. The findings of the present study provide explanation for inconsistent research findings of the effect of (SHS) teachers' age, gender, and computer experience on their computer self-efficacy in the literature on the integration of computer technology into education in both developed and developing countries. In addition, the findings suggest the directions for organising interventions and training to improve teachers' computer self-efficacy to enhance successful integration of computer into teaching and learning. It is argued that the findings of the present study, to some extent, are significant and new contribution to the global literature on integration of computers into teaching and learning. Further research is suggested to be conducted to support or challenge the findings of the study. The suggested research studies should be expanded to include the mediating and moderating roles of the teacher related factors that influence teachers' computer self-efficacy.

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In addition, as indicated by Buabeng-Andoh (2012) Many governments in both developed and developing countries have inited serious investments in computer technology to improve teachhing and learning. For instance, in 2008-2009 the Government in United Kingdom spends (pounds)2.5 billion on ICT in educationa; in United State of America, the Nation spends $6 billion and $4.7 billion on K-12 schools and higher education institutions respectively in 2009 (Nut, 2010 cited in Buabeng-Andoh 2012, pp. 136). In 2008, Morocco spends 12.5% of ither GDP on ICT activities (including education); Senegal spends 10.5% of her GPD on ICT activities including education; and Nigeria spends 3.1% of her GPD on ICT activities including education (Vota, 2010). In Ghana, the integration of ICT into education began to receive government attention in the past years.

Dissemination of Values and Culture through the E-Folklore

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ABSTRACT
This study focuses on the values and culture in the e-folklore. The objectives of the study were to identify and discuss the values in the song lyric 'The Stork and the Mouse Deer'. The song was taken from phone application in the compilation of the 'Kingfisher stories' copyrighted by Dewan Bahasa and Pustaka. The e-folklore was rewritten from the Malay folklore stories. The results of the study showed that the stork has more values as compared to the mouse deer. The stork has good, honest, trust, believe, helpful and concern towards others by giving advices while the mouse deer has good values as in being clever and brilliant. It can be seen that the good values will be disseminated through the e-folklore in order to ensure the readers understand the true meaning of the each values and adapt the values in their everyday lives. This study has used the Malay Methodology theory by Hashim Awang (1994) which states that in all aspects of life there are ways in dealing with life, trust and culture among the society and related to humanity. It is hoped that further studies will focus on the values of e-folklore between human and animals.

Keywords: e-folklore, literature, values, younger generation, technology

INTRODUCTION
Most folklores consist of values that will be understood by listeners and readers of folklores. It can be said that long time ago, the folklores were storytold from mouth to mouth and the stories are still remembered till today. However, the folklore has not been the favourites among the younger generation since the booming of the technology (Normaliza Abd Rahim, 2014a, 2014b). The younger generation would prefer to be with their handphones and laptops and play with an up-to-date games. For instance, in year 2016, Pokemon-go has been the favourite for all generation and this would lead to ignoring the folklores. Although, there were studies that helped in the process of dissemination of the folklore but to ensure that younger generations favor the stories would be a difficult task. Therefore, more studies should be done to encourage all generations to be aware of the existence of the folklore (Awang Azman Awang Pawi, 2015). Awang Azman Awang Pawi (2015) claims that the values and culture should be integrated among the younger generation and hence, the schools should play an important role for the inclusion. As such, creativity in the classroom would be appropriate and relevant (Nikitina, 2011).

STUDIES IN FOLKLORE
There were several studies done on folklore. Among a few, Normaliza Abd Rahim, Hazlina Abdul Halim & Roslina Mamat (2014) study of the integration of folklore in the form of multimedia. The study focuses on the awareness of folklore among learners. The objectives of the study were to identify and discuss the content of dicussion among students in the classroom based on their views and opinions towards the folklore. The samples of the study consists of students who learn the Malay language in the classroom. The results of the study revealed that most of the students were not aware of the folklore introduced in the classroom. Majority of the students were also not aware of the full stories since they only heard it when they were small. It can be seen that it is crucial to ensure their awareness towards the folklore due to the existence of new technology in the classroom. The result of the study by Normaliza Abd Rahim, Hazlina Abdul Halim & Roslina Mamat (2014) also showed that the folklore involves consists of the values as in love, care, helpful, responsible and respect. This study is parallel to the study done by Normaliza Abd Rahim (2014b), Bronner (2012) and Bowman (2004) where the forgotten folklore has yet to be determined by the subjects in the classroom. The study by Normaliza

Abd Rahim (2014a) showed that the subjects were keen in learning the folklore and they felt that most folklores consist of values that will help learners in understanding the stories more.

On the other hand, a study by Arbaie**,** Normaliza Abd Rahim & Nik Rafidah Nik Affendi (2014) has nearly the same results as Normaliza Abd Rahim, Hazlina Abdul Halim & Roslina Mamat (2014) and Normaliza Abd Rahim (2014b) where animal fables from folklore will help to increase motivation among students in the classroom and the values consist in the story were love, share, responsible, helpful and friendly. Subsequently, the stories also help the students in identifying the values that can be adapted in their everyday lives. Consequently, another study by Normaliza Abd Rahim (2014b) also has similar finding with the studies by Arbaie**,** Normaliza Abd Rahim & Nik Rafidah Nik Muhammad Affendi (2014), Normaliza Abd Rahim, Hazlina Abdul Halim & Roslina Mamat (2014) and Normaliza Abd Rahim (2014a) where the study focuses on animal fables from folklore. The study by Normaliza Abd Rahim (2014b) showed that the samples involved in the study have given different perceptions towards the story 'Bird of Paradise' song. The results of the study also revealed that the subjects were able to retell the story according to their understanding from the lyrics of the song. The study by Normaliza Abd Rahim (2014b) also showed that the dissemination of folklore can also be in the form of songs. Here, it can be seen that the song chosen (Bird of Paradise) consists of values like love, care, helpful and responsible.

Other studies related to folklore also focus on values (Awang Azman Awang Pawi, 2011; Bronner, 2012; Siti Noor Riha Sulong & Normaliza Abd Rahim, 2015; Awang Azman Awang Pawi, 2015); Nurfarhana Shahira Rosly, Normaliza Abd Rahim & Hazlina Abdul Halim, 2015; Normaliza Abd Rahim, Hazlina Abdul Halim, Roslina Mamat & Nor Shahila Mansor, 2016; Mohd Firdaus Che Yaacob & Normaliza Abd Rahim, 2016; Barker & Rice, 2016). The study by Siti Noor Riha Sulong & Normaliza Abd Rahim (2015) focuses on language register in the folklore song entitled 'The Brilliant Judge'. Also, this study looks into the values in the folklore. The result of the study showed that the values found in the song are fair, respect and helpful. Also, the results of the study revealed the language register used in the song has made it more understandable based on the song lyrics. The study by Siti Noor Riha Sulong & Normaliza Abd Rahim (2015) was parallel to the study by Normaliza Abd Rahim, Hazlina Abdul Halim, Roslina Mamat & Nor Shahila Mansor (2016) and Bowman (2004) where the students involved in the study were more focused and understood the story better. The study by Normaliza Abd Rahim, Hazlina Abdul Halim, Roslina Mamat & Nor Shahila Mansor (2016) revealed that there were values in the folklore introduced to the students in a classroom among Korean students. The values found in the story were good, honest, trust and helpful. Hence, the study by Nurfarhana Shahira Rosly, Normaliza Abd Rahim & Hazlina Abdul Halim (2015) where the influence of animal story among special needs children has helped the children to focus and understand the content of the story. It can be seen that the study by Nurfarhana Shahira Rosly, Normaliza Abd Rahim & Hazlina Abdul Halim (2015) has shown the values of love, respect and care in the story introduced. Also, a study by Mohd Firdaus Che Yaacob & Normaliza Abd Rahim (2016) showed that there was good value in folklore among the Malay community. This study has shown great impact towards good values in doing good deeds towards others.

Based on the studies above, the objectives of the study were to identify and discuss the values in the story 'The Stork and the Mouse Deer'.

METHODOLOGY

This study focuses on an e-folklore from phone application in the compilation of Malay folklore stories entitled 'Kingfisher stories'. The stories were copyrighted by Dewan Bahasa and Pustaka and the lyrics of the song is written by Normaliza Abd Rahim (2016). Dewan Bahasa and Pustaka is a government body which controls the usage of Malay language and literature in Malaysia. It also published quality books, magazines and multimedia production and organized seminars and conferences pertaining to Malay language and literature. The song entitled 'The Stork and the Mouse Deer' was chosen to disseminate the values in the Malay folklore. This study is using the Malay Methodology theory by Hashim Awang (1994). This theory claims that the aspect of human life relates to the way and attitude of life, trust and the culture at the place among the Malay community. The functions of life can be seen as giving values to life. Although, 'The Stork and the Mouse deer' story is about animal folklore but the story can be related to human life in order to disseminate the values to human.

The Stork and the Mouse Deer

[1]Mouse deer and stork are good friends
[2]One day, they found a big rice crust
[3]So they eat the rice crust from the right to the left
[4]But, the mouse deer is clever
[5]The mouse deer is brilliant

[6]So the stork got cheated
[7]The mouse deer told the stork that
[8]There is good life across the river
[9]The stork believes and the rice crust becomes the boat
[10]They row the boat together

[11]The mouse deer eats the middle of the rice crust
[12]The stork advices the mouse deer not to do so
[13]The water from the river is pouring in
[14]The stork flew away

[15]The mouse deer feels that it cheats itself
[16]Looking at the stork fly away
[17]The rice crust sinks
[18]The mouse deer tries to save itself

Synopsis of the Stork and the Mouse deer

The story entails two good friends, the stork and the mouse deer. One fine day, both of them found a big rice crust. They were so happy. They shared the rice crust and eat them from right to the left. Suddenly, the clever mouse deer had thought of an idea. The mouse deer is also considered as the brilliant animal in the animal kingdom. The mouse deer cheated the stork by telling it that there is a good life across the river. The stork believed and they decided that the rice crust will become the boat for the two of them. They rowed the boat together happily. While rowing, the mouse deer ate the middle of the crust. The stork adviced the mouse deer but the mouse deer ignored. The water from the river kept pouring in. The stork flew away since the mouse deer did not listen to the advice. Then the mouse deer realized that it cheated itself. The mouse deer looked at the stork flying away. Suddenly, the rice crust began to sink. The mouse deer tried to save itself and swam to the river bank.

RESULTS AND DISCUSSION

The value of ‘friend’ can be seen at the beginning of the song. The lines below show,

[1]Mouse deer and stork are good friends
[2]One day, they found a big rice crust
[3]So they eat the rice crust from the right to the left

Lines [1] [2] and [3] above show the value of ‘friend’ where both the stork and mouse deer are close to each other. Good friends also show that they share whatever they have and found. They in fact, eat the crust that they found together. Here, it can be seen that the value of ‘friend’ has played a major role in showing awareness towards children who listen to the song. The value of ‘friend’ has shown that a friend should share what they have and be happy with one another. Hashim Awang (1994) claims that all aspects of life include the way of life and attitude towards life. Here, it can be said that the value of ‘friend’ between the stork and the mouse deer has shown the attitude towards the way of life. Although both the stork and the mouse deer are animals, but the value that they showed will be of examples among readers of folklore.

However, the mouse deer is a very clever animal. It can give opinion to the stork. The lines below state,

[4]But, the mouse deer is clever
[5]The mouse deer is brilliant

Lines [4] and [5] above show that the mouse deer is a very clever and brilliant animal. It has been stated in most folklore that the mouse deer is a clever animal (Normaliza Abd Rahim, 2014a). For instance, from the folklore entitled ‘The Mouse deer and the tiger’, ‘The Mouse deer and the crocodile’, ‘The Mouse deer and the monkey’ and soon. Here, it can be seen that the mouse deer has been a clever animal. The value in the song obviously shows the value of ‘clever’ and ‘brilliant’. In order to disseminate the value of clever in the story means that the person who reads and understands the story is also clever and brilliant. According to Hashim Awang (1994), in order a person is having attitude in life is to explore and find his/her speciality. Here, it can be seen that the mouse deer know that it is a clever and brilliant animal.

Consequently, the mouse deer has expressed to the stork that there is good life across the river. The line below states,

[8]There is good life across the river

The phrase 'good life' as stated above in line [8] shows that the values of good life might be 'happiness', 'loving', 'family', friend' and others. Here, it can be seen that the mouse deer knew about its friend needs as in finding a good life. It knows that by tricking the stork, both of them might be able to cross the river easily. The term 'good life' can be referred to 'loads of fruits', 'loads of food', 'no disturbance from other animals', 'no disturbance from hunters' or in other words, 'live in happiness and harmonious life'. All animals in the jungle will look forward to this kind of life. Barker & Rice (2016) refer good life as being pleasant and helpful. This shows that the stork looks forwards to being living in a serene environment without any hassle in between. Hashim Awang (1994) states that the function of life is to ensure the benefits towards life and therefore, good life would be the major implication.

However, the value of being honest has shown in the stork where it believes what the mouse deer has suggested. The line below states,

[9]The stork believes and the rice crust becomes the boat
[10]They row the boat together

Lines [9] and [10] above show that the stork is a good bird. It trusts the mouse deer and willing to be together with the mouse deer. Hashim Awang (1994) claims that in all aspects of life, a person will show the trust in everyone around him/her. This shows that although both the stork and mouse deers are animals but they actually show the characters like humans. Therefore, the stork has shown that it is an honest animal and believes in the mouse deer. In order for the stork to believe the mouse deer, the mouse deer has shown an honest look and states that there is good life across the river. The life of a stork can be seen that it does not have any hatred in itself. Hence, it believes in the suggestion suggested by the mouse deer. The stork also assumes that both of them would be working together in rowing the rice crust and this would lead to an easier way to go across the river. As in human life, if we work together to achive something, we would be success. However, the collaboration between human would therefore shows the importance of trust and believe among each other. Here, it can be seen that the stork and the mouse deer show the exact life of human in trusting and believing each other to achieve something. According to Darma (2004: 9-10), the meaning of values in literary work will give a greater implication towards readers. Here, it can be seen that the value of being honest, trust, believe and helpful in the stork's life has shown that the reader would feel good and try to be like the stork in their everyday's life.

Subsequently, the good value in the stork does not stop there. The evidences from the lines below show,

[11]The mouse deer eats the middle of the rice crust
[12]The stork advices the mouse deer not to do so
[13]The water from the river is pouring in
[14]The stork flew away

Lines [11] [12] and [13] above show that the stork has been showing its concern towards their well being when they were on the rice crust. The stork gives advice to the mouse deer when the mouse deer eats the middle of the crust. Hashim Awang (1989) claims that in all aspects of life, it is a need for a person to help each other. Either by giving advice for the better or being helpful physically. Here, it can be seen that the stork advices the mouse deer for not eating the middle of the crust. The stork also worries about both of their safety if the crust sinks. The good values in the stork has surprise the mouse deer in the beginning but the mouse deer knows that the stork would be helpful, showing concern and willing to sacrifice its life for the both of them. The stork can just ignore the mouse deer but instead, it helps the mouse deer by giving good advice. However, the mouse deer feels that it is a winner as compared to the stork. Therefore, the mouse deer keeps on the eating the crust and the water from the river nearly sinks the rice crust. At this time, the stork has been disappointed since the mouse deer did not listen to its advice. The stork then, flew away to save itself. The stork's action has shown that after giving so many advices and the mouse deer ignores it, it is about time to leave the matter to the mouse deer to sort it out. The stork might be thinking that the mouse deer needs a lesson to learnt.

CONCLUSION

The results above showed that there were several values in the song 'The Stork and the Mouse Deer' which was adapted from the Malay folklore stories. The results revealed that there are seven values in the song;

'togetherness', 'loving', 'family', 'friend', 'honest', 'concern' and 'helpful'. The stork has shown the values of 'togetherness', 'loving', 'family', 'friend', 'honest', 'concern' and 'helpful' while the mouse deer has shown the values of 'togetherness', 'family', 'friend', and 'helpful' at the beginning of the story. Hence, by the end of the story, the mouse deer has changed and consists of no value accept that at the end of the story, the mouse deer felt regret for cheating its friend. The result of this study is parallel to the study of Mohd Firdaus Che Yaacob & Normaliza Abd Rahim (2016), Mohd Firdaus Che Yaacob & Normaliza Abd Rahim (2014) and Bronner (2012), where there are values in the folklore. Also, this study is parallel to the studies of Normaliza Abd Rahim (2014b) and Nurfarhana Shahira Rosly, Normaliza Abd Rahim & Hazlina Abdul Halim (2015), where folklore has been helpful to learners learning about values.

The results of the study implicates learners in finding values in the folklore. Hence, by disseminating the folklore, learners will also be able to disseminate the values from the stories and adapt the values in their everyday lives. Also, the study implicates educators and researchers in empowering the folklore through researches and studies. It is hoped that further studies will focus on other folklore and ways to disseminate the folklore to the world.

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Examining Cyberbullying Tendency and Multidimensional Perceived Social Support Status of Teacher Candidates

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ABSTRACT
The teachers have a substantial role for students through consciously the Internet usage and struggle with cyberbullying. The purpose of this study is to investigate cyberbullying tendency and multidimensional perceived social support status of the teacher candidates. The participants of this research have become 412 teacher candidates as education faculty students. In this research, co-relational screening model has been used. In addition, Mann Whitney-U and Kruskal Wallis statistical analysis have been used to determine differences within variables. The findings of the study indicate that cyberbullying tendency and multidimensional perceived social support status have been differentiated in accordance with daily the Internet usage time and sexuality. Moreover, according to the attractive findings of this study, the cyberbullying tendency ratio of females has higher than males and the social support ratio of males has higher than females.

Keywords: Cyberbullying, teacher candidate, multidimensional perceived social support.

INTRODUCTION
The developments in field of Information and Communication Technologies (ICT) have been in progress at an unprecedented pace. Web technologies with the Internet have been became widespread fast and became irreplaceable for individuals (Gokkaya, 2014). The several activities could be actualized through the Internet: sharing information, meeting and communicating with the other people, making friend, online messaging, chat, phone conversation, joining the discussion clubs, playing game, sharing photo or image. Using the Internet such an extensive is caused different problems and phenomenon (Fuchs, 2008, p. 5). According to Vanlanduyt and De Cleyn (2007), the Internet involves several disadvantages like affecting social life and relationships negatively, pornography, exposing the violence and unsuitable wording, affecting the physical health negatively, opposing to use time effectively, consisting commercial abuse and extreme consumption risks. Cyberbullying is one of the most popular of the disadvantages and it influences the individual's adversely. Also, cyberbullying symbolizes the cyber dimension of the bullying.

Bullying is defined as iterative activities that contain unbalanced power and aim to harm a person (Kowalski & Limber, 2013; Slonje, Smith, & Frisen, 2013). The literature research indicates that most common bullying types are traditional bullying (physical, oral, relational) and cyberbullying (Wang, Nansel, & Iannotti, 2011). Essentially, cyberbullying is pretended via transferring the traditional bullying techniques to the cyber world as it is understood traditional bullying and cyberbullying are related each other. Put it differently, cyberbullying is a kind of systematic abuse power that occurred through using ICT. Cyberbullying could be singular or collective also it involves all harmful communication types (Bamford, 2004) that are performed through electronic tools such as sms, e-mail, chat, webpages, online games, social network and written messages (Kowalski & Limber, 2013).

In today's world, the Internet have been reachable to each field of life through advanced information technologies (IT) that situation facilitates to reach cyber victims of bullies (Keith & Martin, 2005). In addition, individuals could be faced with cyberbullying at all hours of the day and night, even at the bedroom, via mobile phones and the Internet (Oblad, 2012; Slonje, Smith, & Frisen, 2013). Cyberbullying contains the negative behaviors in the cyber world like recognizing yourself as other, hiding identity, lying, insulting, jawing someone down, rumoring, sharing images of someone without permission (Aricak, Siyahhan, Uzunhasanoglu, Saribeyoglu, Ciplak, Yilmaz & Memmedov, 2008). The reasons of that kind of behaviors could be caused both

as intrinsically (revenge, boredom, jealousy, become non-fighter as characteristic feature) and as extrinsically (cannot reach the results to success) (Slonje, Smith, & Frisen, 2013).

It is possible to say that particularly psychological effects of cyberbullying resemble with traditional bullying (Slonje, Smith, & Frisen, 2013). Kowalski and Limber (2013) have been examine the impacts on psychological and physical health as well as academic performance of cyber and traditional bullying. The research has also considered several criteria: anxiety, depression, self-efficacy, physiological comfort, status of school attendance and academic achievement. The findings of research have shown that the negative effects of cyber and traditional bullying are similar for psychological status, physical health and academic performance. On the other hand, the negative impacts of cyberbullying are more in accordance with some researches (Gimenez-Gualdo, Hunter, Durkin, Arnaiz, & Maquilon, 2015). For instance, the messages of cyber bullies, that is sent to discredit the cyber victim, could be more harmful than face to face messages (Strom & Strom, 2006).

When the effects of cyberbullying were analyzed, they usually zoom in two particular fields: psychological and social. Schenk and Fremouw (2012) have been researched the psychological influences of cyberbullying on 17-24 years adolescents. The findings of the research have indicated that the participants who have exposed to cyberbullying, have several psychological disorders such as depression, anxiety, paranoia. Exposing the cyberbullying damages the social relationships individually (Beran & Li, 2005; Campbell, 2005; Patchin & Hinduja, 2006; Dempsey, Sulkowski, Nichols, & Storch, 2009). Therefore, if the organizations involved the bullies and victims, the organizational climate would be affected negatively by the nature of the circumstances (Jon-Chao, Chien-Hou, Ming-Yueh, & Yi-Ling, 2014). Considering the organizations as school, it is known that the cases of cyberbullying inside the school impact the school climate unfavorable (Williams & Guerra, 2007).

The variety and difference of the cyberbullying types getting increased through increasing social media usage and widening age of the Internet users (Twyman, Saylor, Taylor, & Comeaux, 2010). Despite the fact that, the types of the cyberbullying are not sophisticated or detailed (Slonje, Smith, & Frisen, 2013). They are generally classified in accordance with the using gadget and method. In some studies, cyberbullying is separated two fundamental categories as direct and indirect (Snakenborg, Van Acker, & Gable, 2011). On the other side, new cyberbullying types blossom out with developing technology (Slonje, Smith, & Frisen, 2013). The cyberbullying types have been explained as seen at Figure 1 by Bamford (2004).

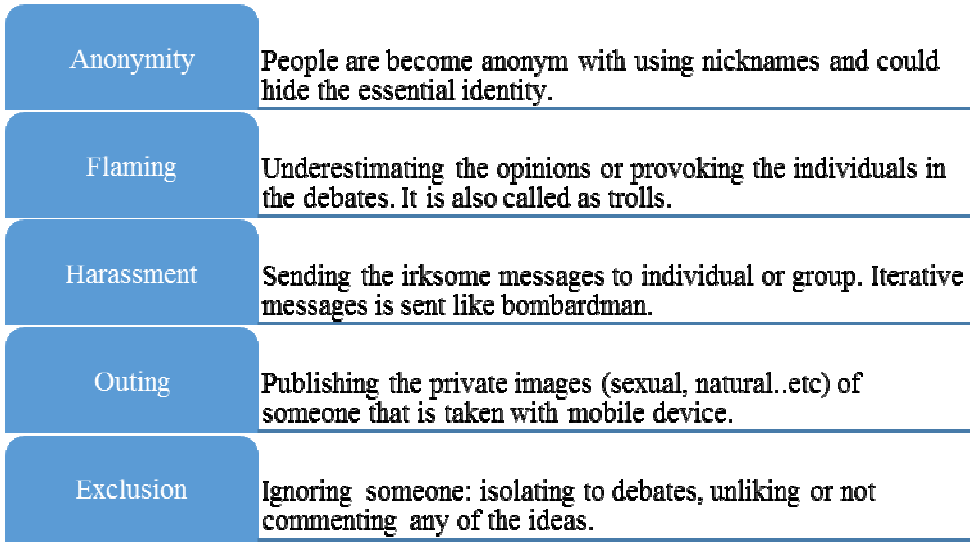

Figure 1. Types of the cyberbullying (Bamford, 2004)

Cyberbullying has three different group as bullies, bullies and victims and victims (Aricak, el al., 2008). It is not easy to detect the first group who are become from bullies (Keith & Martin, 2005; Oblad, 2012; Slonje, Smith, & Frisen, 2013). The reason of the situation is generally caused to hide under the anonym names and used the nicknames on the Internet (Strom & Strom, 2006). The study of Holfeld (2014) demonstrates that the ratio of cyber victims, who sit back and watch, has enormous. Also, the finding is really interesting that more than half of the male pupils have remain unresponsive to the event.

The studies indicate that the widespread ratio of cyberbullying is of massive (Syts, 2004; Bamford, 2005; Beran, & Li, 2005; Patchin & Hinduja, 2006; Kowalski & Limber, 2007; Raskauskas & Stoltz, 2007; Williams & Guarra, 2007; Li, 2008; Schenk & Fremouw, 2012). The research that is made by Campfield (2008) shows that

69% of 6, 7, 8th grade of students either cyber bullies or cyber victims. According to the study of Hinduja and Patchin (2008), %30 of Americans have cyber victims who are over the age of 17. Additionally, Syts (2004) has determined that 39,1% of high school pupils -*between 14 and 18 years*- are the victims of the cyberbullying. 17,1% of the participants who are between 17 and 24 years old, are the cyber victim in accordance with Schenk and Fremouw (2012). Moreover, finding of other research that is of made by Topcu (2008) considers that 47,6% of adolescences within 13 to 21 years old get involved cyberbullying. Furthermore, the penetration ratio of cyberbullying for varied countries has been changed: falling under cyberbullying is 17%-48%, being cyber bully is 4,1%-21% , and to being cyber victim is 9%-35% (Burnukara, 2009).

According to the Aricak et al. (2008), people could be cyber victim regardless of sexuality, age, ethnic origin, socioeconomic status and academic performance. It has been determined by Bamford (2004) that the age of majority of the Internet users are below 25. However, using the Internet is one of the necessity of this era so individuals who are almost of any age, has become an active the Internet user. For example, 70% of 10 years old children are the Internet user in Sweden (Findahl, 2013). According to the report of "social age" that is the organization in UK, more than half of 10 years old children are the social media users (Daily Mail Reporter, 2014). Additionally, absolute majority of the social media users has become between 18 and 29 years within 2005 to 2013 in accordance with the research of Pew Research Center in USA. 30-49, 50-64 and older than 65 age ranges has been followed the group as sequentially (Pew Research Center, 2014).

The investigation of the studies about cyberbullying shows that the most of researches have been made on the pupils of primary and secondary schools whose age between 10 and 18 (Arıcak, et al., 2008). As understood, one of the eigenvalue of this research is arise from the participants who are occurred from teacher candidates as an adult. Teacher candidates are of in the age of majority of social media users and they have an enormous impact to grow students who are the target of cyber threats. Moreover, it has not been encountered any study about cyberbullying tendency of teacher candidates and social support perception status. The purpose of this study is to examine the relationship between cyberbullying tendency and underlying factors of that and social support perception status of teacher candidates. In light of this aim, the problem sentences of this research is determined as "How is the cyberbullying tendency and social support perception status of teacher candidates?". Also, seeking answer to the sub problems below:

- Is the cyberbullying tendency of teacher candidates change in accordance with sexuality?
- Is the social support perception status of teacher candidates change in accordance with sexuality?
- Is there any differences between the cyberbullying tendency of teacher candidates and the Internet using time?
- Is there any differences between the cyberbullying tendency of teacher candidates and the educational status of their parents?

METHODOLOGY

Research model

In this research, screening model has been used in order to portray the current status. Besides, co-relational pattern that is the derivation of screening model has been preferred. Purposing to determine corporeity or ratio of alteration between two and more variables with using co-relational screening model (Cohen, Manion, & Morrison, 2007).

Population and sample

The participants of this research has become 412 teacher candidates who are the students of the education faculty. The one of the quantitative sample method as the random sample method has been used in order to convenience generalizability to population (Marshall, 1996).

Data collection tool

The data of this research has been collected with using "Personal Information Form", "Cyberbullying Attitude Scale" and "Multidimensional Scale of Perceived Social Support".

Cronbach Alfa internal consistency parameter has been calculated as .93 of "Cyberbullying Attitude Scale (CBAS)" that has been used to determine the cyberbullying tendency of participants. The scale has been developed to measure cyberbullying tendency of individuals and it involves 40 items as 5-point Likert. The positive and negative expressions have been graded as "strongly agree", "agree", "neither agree nor disagree", "disagree" and "strongly disagree" (Turkoglu, 2013). In addition, "Personal Information Form" has been occurred to detect demographic status of the participants.

"Multidimensional Scale of Perceived Social Support (MSPSS)" that was developed by Zimet, Dahlem, Zimet and Farley (1988), has been used to determine perceived multidimensional social support of participants. The

validity and reliability studies of the scale has been made by Eker and Arkar (1995) in Turkey and perceived social support factors of individuals could be stated through the scale. The scale consists 12 items, could be comprehended by everyone. High scores show high perceived support, besides, low scores show unperceived support or deprived from support (Altinay-Cebeci, Aydemir, & Goka, 2002).

Data analysis

The demographic information of participants have been grouped and findings gathering from CBAS and MSPSS have been evaluated with using statistical analyze software. The demographic knowledge have been presented the "findings" part of this research as frequency and percentage. The normal distribution has not been determined in accordance with Kolmogorov Smirnov test result ($p<.05$). The reason of this situation is caused the negative concept of cyberbullying and negatively skewed distribution has been shown at the histogram graphs. Kruskal Wallis and Mann Whitney-U as non-parametric tests have been used in order to negatively skew distribution.

FINDINGS

The demographic knowledge of participants has been offered below: sexuality, education status, income status and period of time using the Internet.

Table 1. Frequency and percentage values for sexuality variable

	f	%	$\%_{gec}$	$\%_{yig}$
Female	295	71.6	71.6	71.6
Male	117	28.4	28.4	100.0
Total	412	100.0	100.0	

As seen at Table 1, joined teacher candidates of this research comprise of 71,6% female, 28,4% male.
As presented at Table 2, the education status of mother and father have been determined as 67,2% and 50,2% respectively. The education status of father is higher than mother for other grades.

Table 2. Frequency and percentage values for education status of parent variable

		f	%
Mother	Primary school	277	67,2
	High school	87	21,1
	Bachelor degree	29	7,0
	Not educated	19	4,6
	Total	412	100,0
Father	Primary school	207	50,2
	High school	117	28,4
	Bachelor degree	88	21,4
	Total	412	100,0

17,7% of the participants have the Internet user for 2-5 year also, 74,5% of them have used the Internet more than 5 year. Findings at Table 3 show that the majority of participants are of active The Internet user.

Table 3. Frequency and percentage values for period of time using the Internet variable

	f	%	$\%_{gec}$	$\%_{yig}$
Less than 1 year	5	1,2	1,2	1,2
1-2 year	27	6,6	6,6	7,8
2-5 year	73	17,7	17,7	25,5
More than 5 year	307	74,5	74,5	100,0
Total	412	100,0	100,0	

The participants' answers of question that indicate the approximate spending time on the Internet for a day have been presented at Table 4. The daily internet using time of participants have been determined as 2-5 hour for 35% and 1-2 hour for 34,7%. 16,3% of participants have indicated that they having spent more than 5 hour on the Internet for a day. Additionally, 52,4% of them have remarked as the social media is the main purpose of

using the Internet. Merely 25,7% of the participants have used the Internet to prepare homework. Moreover, 94,2% of the participants have used the mobile phones to connect the Internet.

Table 4. Frequency and percentage values for daily the Internet using time variable

	f	%	$\%_{gec}$	$\%_{yig}$
Less than 1 hour	58	14,1	14,1	14,1
1-2 hour	143	34,7	34,7	48,8
2-5 hour	144	35,0	35,0	83,7
More than 5 hour	67	16,3	16,0	100,0
Total	412	100,0	100,0	

As seen at Table 5, Mann Whitney-U results have remarked that there is statistical significance within the mean rank of groups (z=-2.879; p>.004). Also, the significance has militated in favor of female. The detection shows that cyberbullying tendency of females have higher than males. On the other hand, it has not been determined statistical significance between being cyber victim and sexuality.

Table 5. Mann Whitney-U results to determine the differentiation of cyberbullying tendency in accordance with sexuality

	N	$\bar{x}_{sira}$	$\sum_{sira}$	U	z	p
Female	295	195.87	57781.00			
Male	117	233.31	27297.00	14121.00	-2.879	.004
Total	412					

The Mann Whitney-U analysis is used and the statistical significance that on side of male, has been detected between MSPSS and sexuality. This mean, the perceived social support of males has much more than females.

Table 6. Mann Whitney-U results to determine the differentiation of MSPSS scores in accordance with sexuality

	N	$\bar{x}_{sira}$	$\sum_{sira}$	U	z	p
Female	295	221.60	65372.00			
Male	117	168.43	19706.00	12803,00	-4,096	,000
Total	412					

As remarked at Table 7, the statistical significance has been explored between the two variables. Correspondingly, Mann Whitney-U analysis has been applied to determine the difference of subclasses.

Table 7. Kruskal Wallis-H results to determine the differentiation of cyberbullying tendency in accordance with daily the Internet using time

	N	$\bar{x}_{sira}$	x^2	sd	p
Less than 1 hour	58	189.40			
1-2 hour	143	195.59			
2-5 hour	144	205.32	10,221	3	,017
More than 5 hour	67	247.13			
Total	412				

The cyberbullying tendency of the participants who used the Internet more than 5 hour for a day, has much more than the other variables. According to this finding, it is possible to say that both of the cyberbullying tendency and daily the Internet using time have a directly proportional relationship.

Table 8. Kruskal Wallis-H results to determine the differentiation of cyberbullying tendency scores for subclasses in accordance with daily the Internet using time

	Less than 1 hour	1-2 hour	2-5 hour	More than 5 hour
Less than 1 hour	$\bar{x}_{sıra}$=99,18	p>.778	p>.361	p<.007
1-2 hour		$\bar{x}_{sıra}$=95,59	p>.475	p<.005
2-5 hour			$\bar{x}_{sıra}$=140,49	p<.014
More than 5 hour				$\bar{x}_{sıra}$=43,78

The statistical significance has not be determined from Kruskal Wallis results about education status of parents and cyberbullying tendency (Mother: p>.965; Father: p>.154).

DISCUSSION

The Internet is a communication tools that offers easy, fast, continuous and two-sided information flow to the large mass. Particularly with increased mobility in recent years, it provides accessibility and reachability. However, using the opportunities of ICT as inappropriate and uncontrolled has been caused to blossom out the several problems. Cyberbullying is one of them. Teachers have enormous role and responsibility to prevent the cyberbullying and steer to use the Internet consciously.

The social relationships have essential role to handle of hard side of life and to resist the negative effects of stress. The concepts like loneness, social support and social network that have been the substantial topic of many researches, are the key to comprehend various types of psychological health (Tezer & Arkar, 2013). The regression analysis could not be applied in order to non-normal skewed distribution. On the other side, it is possible to mention via findings, it could be statistical significance between being cyber bullies, being cyber victims and perceived social support. The finding of this study that females have been higher cyberbullying tendency and lower MSPSS scores as opposite of males. From this point of view, it could be interpreted that inversely proportional within being cyber bullies and MSPSS. Moreover, it has been prescribed that individuals who had low perceived social support, are prone to cyberbullying at later ages. Another reason of this fact could be caused through high level of being cyber victim of females in the past.

It has to be considered the Internet using environment and, variety and quantity of social activities as the risk factors of cyberbullying (Twyman, Saylor, Taylor, & Comeaux, 2010). The cyberbullying types in field of iteration and unbalanced power have a relationship several criteria like age, sexuality and sequence of events. The differentiation between traditional and cyberbullying has caused by impacts of cyber victims, handling strategies and prevention opportunities (Slonje, Smith, & Frisen, 2013). Cyberbullying aims to take control with iterative back-breakings like traditional bullying (Arıcak, et al., 2008). The physical power is not one of the necessities of cyberbullying despite the fact that the unbalanced power has been brought with the high number of groups. Although, in both cases it has been possible to said that cyberbullying has been caused by unconscious ICT usage and anonym individuals of social media (Slonje, Smith, & Frisen, 2013) who give free rein to themselves through hiding the cyber identities. If considering the easy accessibility of target of cyber bullies, the target would be under threat -*high exposure probability*- of similar behavior from same cyber bully. Besides, being cyber victim through social media that is reachable to anyone could be take attention within same social network. Correspondingly, cyberbullying has risen as rolling snowball with iteration and provoking each other. In addition, unbalanced status could be increase through bullying of lots of people on solely one victim as method of popularity and isolated (Slonje, Smith, & Frisen, 2013). The findings of this research indicate that individuals between 18-26 years old (especially females) have been get further away from being cyber victim and canalized to being cyber bully. This circumstance could be explained as cyberbullying tendency increases in the upcoming years for the individuals who had expose to cyberbullying in childhood.

The most of the studies have determined the relevance between using time period of the Internet based communication tools and cyberbullying (Ybarra & Mitchell, 2004; Li, 2005; Erdur-Baker & Kavsut, 2007; Smith, Mahdavi, Carvalho, Fisher, Russell & Tippett, 2008; Aricak, et al., 2008; Twyman, Saylor, Taylor, & Comeaux, 2010; Cakartas, 2012). The finding of this research has supported the knowledge through determined statistical significance between the Internet using time of teacher candidates and cyberbullying tendency. The analysis on the Internet using time has showed that the significance has in favor of more than 5 hours of the Internet users. This finding indicates that 5 hour has breaking point particularly social media platforms.

One of the interesting finding of this research is of the cyberbullying tendency of females has the higher than males. This finding could be caused that 71,6% of the participants have comprised of females although it has

been considered that the majority of education faculties pupils have occurred females. The higher ratio of female cyber bullies (Smith, et al., 2008) could be the reflection of being cyber victim in puberty. Likewise, exposing cyberbullying of females has more than males has been determined by several researches (Kowalski & Limber, 2013; Burnukara, 2009; Temel, 2015; Keith & Martin, 2005). On the other hand, the findings of Baker and Kavsut (2007) have pointed out that the male high school students have been both cyber bully and cyber victim more than females. Moreover, it has been detected by Bayram and Sayli (2013) that 66% of female university students have never been cyberbullying in spite of approximately 51% of males have exhibit cyberbullying behavior at least one.

The reachable result of this research shows that the MSPSS status of females has been lower than males. This determination could be related with high cyberbullying tendency ratio of females. Moreover, the research of Soylemez (2013) has investigated the social skills of teacher candidates in accordance with the status of social network usage. According to the results of the study, social skills of the teacher candidates have statistical significance in several factors: status of being member of social media, the time of social media member, the number of actively using social media, the daily using time of social media, the interpretation status of the social media contents and the using involved “smiles” status of social media.

Cyberbullying is the security problem for publics (Aricak, et al., 2008). Furthermore, cyberbullying has been accepted as a crime and the inspection of cyber world has been made by the police in the developed countries (Strom & Strom, 2006). The responsibilities of police in these countries have prevented of detected the cyberbullying through the methods like informing the public or inspection (Vandebosch, Beirens, Haese, Wegge, & Pabian, 2012). Besides, the police officers who are responsibility in field of informatics like cyberbullying have conducted all preventive activities: awareness rising, protection, taking measures, following, etc. (Sinclair, Bauman, Poteat, Koenig, & Russell, 2012).

When analyzed the preventive activities of schools of cyber bulling in developed counties, it has been seen that awareness and consciousness raising activities have an essential role on top of preventive measures. In this context, the specialists of psychological consultant and coaching have a role to increase the cooperation within cyber victims, parents and teachers. Also, they have tried to raise the consciousness for the secure the Internet usage (Moreno, Egan, Bare, Young, & Cox, 2013). The children have need extra guidance and social support (Gimenez-Gualdo, Hunter, Durkin, Arnaiz, & Maquilon, 2015) because of the fact that parents have responsible to inform their children about secure the Internet usage (Moreno, Egan, Bare, Young, & Cox, 2013). According to Simons & Bynum (2014), the school management has to incorporate the parents in the struggle process of cyberbullying and create the strong cooperation between school and parent. Moreover, the most of the developed rules of local managements to cyberbullying have usually been for K12 level education organizations (Washington, 2015). Pauli Smith and Blumberg (2012) have mentioned that cyber-crimes could be prevented with the regulations under the titles of legal legislation, school enforcement, child rights and responsibilities.

The suggestions being developed through the findings of this research and literature, have been offered below:

- The teachers who have peer to peer interaction with students, should be susceptible about cyberbullying and display sensitivity to struggle this problem. On the other hand, the result of this research has worrisome in order to show the majority of teacher candidates have cyberbullying tendency. The society of future would be blossomed out by the today’s teacher candidates so comprehension of cyberbullying and having guided abilities have momentous substantial. From this view, the pre-service trainings and conferences could be organized to affect positively the cyberbullying perception of teacher candidates.
- The results of this study indicate that the cyberbullying tendency of females has higher than males. Accordingly, two special cyberbullying pretention programs could be planned to each gender.
- The findings show the statistical significance between spending time on the Internet and cyberbullying tendency of teacher candidates. Besides, the Internet usage time of participants has been determined over than standards. Form this point of view, it is possible to say that the technology literacy status of teacher candidates should be increased consciously. The lessons like “Technology Literacy” or “Digital Ethic” could be involved the education faculty programs in order to gained these outcomes to today’s teacher candidates who are Y generation and called as digital native. The concept of these lessons could be occurred coming strategies and methods of cyberbullying both individuals and teachers.
- Interpreted research findings without regression analysis indicate inversely proportional statistical significance between MSPSS and status of cyber bully or victim. In this point of view, teacher candidates could be directed with offering suitable environment to sport, art and cultural activities in order to increase social skills.

- The quantitative data has been used in this research through it does not reflect the personal life of participants about cyberbullying. The reasons of the quantitative acts could be investigated with qualitative researches. Thus, the particular preventions for cyberbullying could be taken with determining the relationships between qualitative and quantitative researches.

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Information and Communications Technology Acceptance among Malaysian Adolescents in Urban Poverty

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ABSTRACT
This study was conducted to identify the information communication and technology (ICT) usage among adolescents in urban poverty and their acceptance of using ICT in teaching and learning (T&L) process. The Technology Acceptance Model was used in determining the acceptance of ICT by focusing on factors such as perceived ease of use and perceived usefulness as the two main factors that is much referred for technology acceptance. This case study was conducted using a quantitative and a questionnaire was used to collect data from 50 respondents. SPSS software was used in the form of descriptive statistics. The results showed that majority of the respondents do not spend much time in using ICT at home or even during class session. However, their acceptances in using ICT are positive in T&L process. Based on the findings, suggestions have been proposed to increase the effective use of ICT among adolescents in urban poverty.

Keywords: adolescent, urban poverty, information communication and technology, technology of acceptance model

INTRODUCTION
Noor (2006) defined the term information communication and technology (ICT) as a technology tool for aiding in communication, processing and sending of information in electronic form. The use of ICT can provide numerous benefits to users such as help in disseminating information, social interaction, education, entertainment, health and so on (Nayak et. al., 2010). The era of information technology use began in latter part of the 1990s, developing rapidly until now. National development in Malaysia has undergone various changes beginning from the agricultural era to the industrial development and currently the transformation in the information and communications technology (ICT) field. Walsham et al. (2007) stated that ICT use helps in the development and growth of a national economy especially in developing countries.

From the aspect of digital technology use in Malaysia, the use of telephone network had been introduced in 1874, followed by the introduction of computer technology in 1966. The Malaysian government had taken the step to inculcate ICT based economic development in the Eighth Malaysia Plan, followed by the Ninth and Tenth plans where ICT was seen as a key enabler and one of the components and major objectives in national development. Various steps were taken and efforts implemented in order to achieve sustainability in programs and projects carried out such as Smart Schools, telehealth, research and development cluster, Multimedia Super Corridor, cyber city and so forth (Musa et. al., 2012).

Malaysia targets to be a developed nation by 2020 and also has taken the initiative to widen ICT usage in society in order to bridge the digital divide and in efforts to expand the knowledge based economy. In 1994, the Malaysian government introduced the National Telecommunications Policy to enhance the capacity to use ICT in society. The national Vision 2020 envisages a society based on information and knowledge. In efforts to achieve Vision 2020, the Government has carried out several programs and prepared the requisite infrastructure.

One of the elements that can facilitate economic development and social development in a country is by rapid development in ICT use. From the aspect of economic development of a country, Kriz & Qureshi (2009) state

that ICT use is regarded as a tool contributing to economic development. This scenario shows that most countries all over the world have used various approaches to implement ICT usage in developing society. According to Elgar (2009), most countries all over the world have taken the opportunity to widen ICT usage in community development.

ICT USE AMONG ADOLESCENT IN URBAN POVERTY

The term "adolescent" in general refers to those in transition between childhood and adulthood or aged in the range 12 years to more than 20 years (Azyyati et al., 2013). This group plays a very important role as the foundation of national prosperity and economic development. Adolescents who stay in the urban poverty areas usually are associated with the community living in poverty in urban areas. Although poverty is also happening in the rural areas, the urban locations are more often mentioned in any discussion on poverty. According to Kamus Dewan (2007), the term poverty is related to poor, lack and indigence. Mohamed (2010) stated that to measure the level of poverty of a household, one guideline is the poverty level.

The National Statistics Department of Malaysia (2013) stated that the poverty level income is the minimum basic food needed by the household members, meaning that it is the non-food requirement for each member. The basic household income or basic needs obtained allows them to function in society. Based on the poverty level income (PGK), the household is regarded as poor if its monthly income falls below the PGK. Hence, if the monthly household income is lower than the PGK, for example the household is only able to fulfill the basic needs from the aspect of minimum nutritional needs of the household members to have a healthy body; they will be regarded as the absolute poor. Siti (2009) stated that poverty encompasses multiple elements such as lack of nutrition, and low health status, low education and low income, unemployment, unsafe housing, not having modern necessities, having unstable job prospects, negative attitude to life and outdated thinking.

Giligan (2006) emphasized that the location aspect of an area also influences ICT use whereby for rich or modern areas, the rate of Internet use is higher than that in poor and backward areas. Studies by Owo (2010) support Giligan (2006) by revealing that users of ICT are more likely among the rich and well educated as opposed to the poor. This clearly shows that the urban poverty community is made up of the marginalized and those dropouts from the mainstream development unless positive steps are taken to narrow the digital divide. ICT also plays a role in affecting in a positive or negative way the life of adolescent. Access to the world without borders has influenced the life of youth with modernization and globalization these days.

The issue of digital divide emerged when there exists disparity between the areas using technology and those areas lacking in technology use. This term paints a picture related to the disparity between urban and rural areas (World Youth Report, 2003). According to Kemly (2006), digital divide can be categorized into several aspects such as access to ICT facilities, the level of ICT use as well as quality or awareness in using the technology. Norfatimah (2013) stated that in the use of broadband in 2013, Malaysia is in the second place in terms of broadband usage in the Asean region. However, there are some challenges and problems faced by the urban poverty in ICT usage. According to Siti (2014), among the problems and challenges faced are limited infrastructures, incapability to buy ICT equipment, lack of knowledge on ICT use, lack of skills, lack of training in ICT use and so forth. This clearly shows that focus on the urban poverty is needed in ICT usage. The appropriate focus should be given in order to help the urban poverty raise their standard of living.

ICT IN EDUCATION

According to Doris et. al., (2012), education plays an important role in improving a country economic growth as well as help in increasing the knowledge and skills for a better life. Suhid (2005) also states that education help to overcome problems of moral decadence in the society specifically among youths who will be a catalyst for the country. According to Spector (2012), the technology expansion has affected almost all sides of life specifically in teaching and learning process. In the 21st century, the use of ICT has been the focus to stimulate and improve the effectiveness of the teaching and learning (T&L) process (Zhao, 2007, Mcalister et. al., 2005; Goodison, 2002). The examples integration on using ICT in T&L process are the use of computer, a Liquid Crystal Display (LCD), printers, radio, and television, as well as a variety of software such as Ms Word, Ms Powerpoint, electronic spreadsheets, Internet and so on (Shelly et. al., 2004 and William, 2000).

ICT is a technology tool to help and facilitate communication and processing besides information delivery through electronic means. One of the elements to help accelerate economic development and social development is the rapid growth of ICT in use. Nevertheless, many problems and challenges are faced by the urban poverty community from the aspect of using ICT in teaching and learning process. The role of ICT in education must be seen as something that accelerates the learning process more effectively. Learning refers to the process of acquiring new knowledge, skills, attitudes and values whereby indirectly the behavior of the individual will

change. The use of ICT brings a creative and supportive learning environment that is able to transform pedagogy and learning in any event it still gives knowledge (Volman and Eck, 2001).

ICT plays an important role in the life of society in upgrading their daily lives. Thus, secondary adolescent in urban poverty should take the initiative to use ICT in teaching and learning process. This is because according to Azahar (2004), the need to improve the standard of education in Malaysia is very important to produce human capital with excellent academic achievement in contributing to the progress of the country.

THE AIM OF THE STUDY

The emergence of technology in Malaysian education system has grown; however there is still lack of studies focusing on the use of ICT in T&L process among adolescent in urban poverty. The needs of educational transformation in terms of value and morality are very important, especially among adolescents who will be the catalyst for the country. Attention must be given to the pattern of ICT use among adolescents especially adolescent in urban poverty in terms of purpose of ICT use, factors influencing ICT usage and effectiveness of using such tools among the urban poverty adolescents; this will ensure ICT usage can help develop healthy lifestyle practices among adolescent in future. The adolescent in urban poverty are recommended to take various initiatives in using ICT based tools given that ICT use is able to change their lifestyle and wellbeing. Hence, the main objective of this study is to identify on ICT usage among adolescents in urban poverty and their acceptance in using ICT based on theory of acceptance model (TAM) in T&L process.

THEORETICAL FRAMEWORK

Acceptance is the situation of behavior that demonstrates agreement to new condition or situation. In this study acceptance is a state that adolescent in urban poverty show positive behavior toward using ICT in T&L process. Many researchers used the TAM including studies about health care and mobile banking. Technology acceptance model is retrieved from Theory Reasoned Action which is one of the core theories in psychology (Fishbein & Ajzen, 1980). Theory Reasoned Action is determined in what way individual's behavior affected by intentions and if based on the pervious behavior and action. Technology acceptance model has been used as a guideline for this study based on two major elements of this model which are perceive usefulness and perceive ease of use. These two elements can determine the three research objectives of this study. Davis in 1989 introduced TAM model when he was researching about social psychology. This model attempts to anticipate and clarify why user accept or reject a computer-based innovation (Davis, 1989). According to TAM model two major elements have influence on user behavior concerning to technology usage: perceived ease-of-use (PEU) and perceived usefulness (PU). This conceptual framework is started with perceived ease of use. Based on the TAM model, if usage of specific technology be simple then people find that technology easy to operate for them. These imply that if the medium able to enhance and improve in teaching and learning process, thus it may be easy to use appropriately. Ease of use may have a positive influence on students learning and knowledge achievements because they would not be confused on how to use the new intervention and struggle when using the technology in future. Moreover, this model suggests that the perceived ease of use has impact on perceived usefulness of a technology. Owing to the fact that if a person find operation with a technology is easy, therefore that technology appears more beneficial for that person (Davis, 1986).

Technology acceptance model has been used as a guideline for this study based on two major elements of this model which are perceived usefulness and perceived ease-of-use. This study used the technology acceptance as theoretical framework as an intensive, predictive and powerful model to explain and predict the acceptance of using a new technology to the users. According to Joo et. al., (2014), perceived usefulness and perceived ease of use has a major impact on satisfaction in learning. In this study, perceived usefulness means students believe that the use of ICT is useful for their learning regarding the enhancement in their learning performance. In this study, perceived ease of use means students are inexperience with the use of technology, face difficulties to use the technology and do not feel any complexity about working with podcast. According to Davis (1989), if people understand applying technology is simple and easy for them, they will use the technology in future.

RESEARCH METHODOLOGY

This research was conducted at a University in Malaysia and instructor held a workshop for a period of five weeks which focused on topic of poverty with the use of ICT in T&L process. Topics consist of poverty issues, namely financial poverty, poverty status, poverty inclusion, participation poverty and poverty ability in duration of 60 minutes per sessions. Purposive sampling was conducted in this research and 50 adolescents who were secondary students in urban poverty areas were selected as the subjects of research. The researcher used questionnaire as an instruments to collect and analyze data. This research used a modified Davis questionnaire by Davis (1980) because of the differences in technological device. The original questionnaire was concerning on using graphic software however this research focuses on the usage of podcast in the teaching and learning

process. Besides, the target group for the original questionnaire was on adults' learners whereas this study was school students; hence some questions were changed to make them understandable to school students.

The modified questionnaires were tested with I-CVI test by including a few experts. The result for all items in the questionnaires was I-CVI >0.80 (1.0>0.80) and considered evidence of good content validity for all items. The results of the Cronbach Alpha also are more than 0.80. This questionnaire has been divided into three parts. The first part is to determine the usage of ICT among adolescent in urban poverty which consisted of 4 items. The second part is to investigate perceived usefulness of using ICT which consisted of 4 items with seven likert scales from strongly agree to strongly disagree. The third part explored on the students' perceived ease of use of ICT in T&L process which consisted of 3 items with the same rating scales from strongly agree to strongly disagree. The questionnaire data were analyzed in descriptive statistics using SPSS software. Data responses were analyzed in column charts with the percentage, Mean (*M*) and Standard Deviation (*SD*). This study also focused on the use of ICT (digital technology) as a platform for supporting the T&L process. Digital technologies used in this study were computer, laptop, LCD, Youtube (video), digital pen & touch, E-quiz, E-games and Powerpoint. TAM was used to find out the acceptance on using ICT based on two main factors that much referred in this model such as perceived usefulness and perceived ease of use.

Findings and Discussion

Both the descriptive and inferential findings are presented in this section. The descriptive findings include percentages, means and standard deviations. Table 1 showed the ICT usage among adolescent in urban poverty.

Table 1. The ICT usage among adolescent in urban poverty.

No.	Questions	Percentage (%)
1.	Is any of these devices available for you to use at home?	
	a) Never have	79
	b) Computer or laptop	21
	c) Printer	0
	d) Scanner	0
	e) Video camera	0
	f) Document camera	0
	g) Other: Please state: …….	0
2.	How often do you use any of ICT devices at home?	
	a) Never use	79
	b) About half an hour a week	10
	c) About an hour a week	11
	d) About two hours a week	0
	e) About four hours a week	0
	f) About five hours a week	0
	g) About six or more hours a week	0
3.	At school, how much time do you spend using the ICT during classroom lessons?	
	a) Never use	60
	b) About half an hour a week	40
	c) About an hour a week	0
	d) About two hours a week	0
	e) About four a week	0
	f) About five a week	0
	g) About six or more hours a week	0
4.	How much time do you spend using the computer at school outside classroom lessons, e.g. in cyber cafe?	0
	a) No time	0
	b) 0 – 5 minutes	0
	c) 0 – 15 minutes	22
	d) 0 – 30 minutes a week	78
	e) 0 – 45 minutes a week	0
	f) 0 – 60 minutes a week	0
	g) More than 60 minutes a week	

Referring to item 1, majority of respondents stated that they never have any of ICT devices for them to use at home. For item 2 regarding on how often do the respondents use any of ICT devices at home, 79% agreed that

they never use any of ICT devices at home, 10% used about half an hour a week and 11% used about an hour a week. Item 3 showed that 60% of the respondents agreed that they never use or spend time using ICT during classroom lessons whereas 40% stated that they used about half an hour a week in classroom lessons. Item 4 also showed that 78% agreed that they spend using the computer outside classroom lessons and 22% stated about 30 minutes a week they spend using the computer outside classroom lessons. Overall, form the findings it can be concluded that majority of the respondents' agreement towards the usage of ICT at home or at school is reported low levels. More than 50% of the agreement for item 1-4 showed that they still unfamiliar in using ICT as they do not spend much time in using ICT at home or even during classroom session. Although the Malaysian Ministry of Education is clearly aware of the importance of merging ICT in the curriculum, still there are some difficulties in implementing ICT facilities in schools. Unavailability of some infrastructures might be the reasons for unsuccessful migration to ICT based curriculum especially in urban poverty areas. Haryati and Sharifah (2009) also agreed that in Malaysia, there are many issues and problems specifically related to facilities, services, costs and modes of transportation which will be a constraint in achieving a good quality of life in urban areas. The researcher believed that this might be the reasons why the ICT usage among adolescent in urban poverty was still at low level.

To determine the adolescent in urban poverty acceptation of using ICT in T&L process, Table 2 showed that more than 60% of the respondents agreed with all the questions presented. Each of the items recorded a mean exceeding 2.50; indeed, the percentage agreeing exceeded two-thirds of the total number of respondents involved. This finding shows that on the whole the adolescent in urban poverty agreed that usage of ICT fulfils their acceptance as stated in TAM model hence enhancing quality in the teaching and learning session.

Table 2 Percentage, mean and standard deviations on the factors of perceived usefulness and perceived ease of use.

No.	Questions	Percentage (%)	Mean	SD
	Perceived usefulness			
1.	Using ICT in my study would enable me to understand the lesson more quickly.	73	2.88	(0.90)
2.	Using ICT would improve my study performance.	71	2.85	(0.87)
3.	Using ICT would make it easier to understand the concepts and instruction.	69	2.75	(0.85)
4.	I would find using ICT is useful in my T&L process.	67	2.70	(0.84)
	Perceived ease of use			
1.	In my study, I am mostly likely to use ICT in teaching and learning process.	72	2.82	(0.81)
2.	I predict that I will use ICT on regular basis in the future.	65	2.67	(0.79)
3.	I will become an ICT user in future.	60	2.63	(0.73)

- Information Communication and Technology (ICT)

The result of first factor which it is perceived usefulness presents that for item 1, 73% with mean and standard deviation of 2.88 (0.90) were strongly agreed that ICT helps them to understand the lesson more quickly. Moreover 71% of respondents with mean and standard deviation of 2.85 (0.87) were strongly agreed that usage of podcast improve their study. Furthermore 69% of respondents with mean and standard deviation of 2.75 (0.85) were strongly agreed that using ICT make easier for them to understand concepts and instructions. Additionally 67% of respondents with mean and standard deviation of 2.70 (0.84) were strongly agreed that ICT is useful. For second factor which it is perceived ease of use, 72% with mean and standard deviation of 2.82 (0.81) were strongly agreed that they were most likely to use ICT in teaching and learning process. Moreover 65% of respondents with mean and standard deviation of 2.67 (0.79) were strongly agreed that they predict that they will use ICT on regular basis in the future. Furthermore 60% of respondents with mean and standard deviation of 2.63 (0.73) were strongly agreed that they will become an ICT user in future.

According to the result, this study has adherence with technology acceptance model (Davis, 1989). The two dimensions of TAM model which are perceived usefulness and perceived ease confirmed has influence on using ICT among adolescents in urban poverty. Sun and Zhang (2006) also reported that perceived usefulness and

perceived ease of use are the dominant instrumental beliefs of individual usage intention. Adolescents living in urban poverty areas need to make full use of various initiatives to use ICT based tools considering that ICT use is capable of changing their lives. The finding of this study demonstrated that although majority of respondents stated that they never have any of ICT devices for them to use at home, thus they didn't experiences any difficulties and didn't feel any complexity in using ICT in teaching and learning process. This finding is consistent with studies by Roselan (2003) which states that the effectiveness of the teaching process depends on ICT equipment that is used as an intermediate platform between teachers and students. The use of ICT could improve productivity and living standards among urban poverty communities. Musa (2010) also states that ICT plays an important role in community life because it is capable of improving effectiveness and raising the daily standard of living of the community. A study by Jeynes (2002) states that socio-economic factors such as educational background, employment status and income levels also affect the education of students.

CONCLUSION AND RECOMMENDATION

This study contributed a practical approach for teachers and schools specifically in urban poverty areas to embrace technology on their curriculum. As a developed country, Malaysia has taken various initiatives to expand the use of ICT at all levels of society. This is because the use of ICT can help in the economic growth and social development of a country. (Walsham et al., 2007). Ruth (2007) also agreed that the use of ICT can help to overcome and eradicate poverty in a country. Mohd (2010) agrees that ICT plays a key role in the life of society at every level. The findings of this study is important to Curriculum Development Centre (PPK), Malaysian Ministry of Education as a guide to implement the use of ICT in teaching and learning process. Thus, it is suggested that the Ministry of Education should play an important role in providing ICT facilities especially in urban poverty areas school. This is because most of the schools in urban poverty areas are lack of ICT facilities. All parties must play their part in ensuring they cooperate so that ICT use in urban poverty areas is beneficial and maximized in line with developments in urban areas. This will help bridge the digital divide in ICT use between rural and urban society. It is suggested that guidelines be developed as well as working plan for evaluating the effectiveness of ICT use to help develop the economy of the urban poverty community. This is because ICT practice and use can enhance productivity as well as the living standards of the urban poverty.

According to the result, this study has adherence with technology acceptance model (Davis, 1989). The two dimensions of TAM model which are perceived usefulness and perceived ease of use has influence on using ICT among adolescents in urban poverty. As this research had discovered that the use of ICT are positive among adolescents in teaching and learning process, thus teachers should emphasize on using ICT optimally at school. Teachers should work towards creating a fun learning process which would attract students' interest to learn and increase their motivation in teaching and learning process.

This study only focused on the use of ICT such as digital technologies (laptop, LCD, Youtube (video), digital pen & touch, E-quiz, E-games and Powerpoint). Other studies can be done using different platforms such as Proboards, Edmodo, Spicynodes, Teamweaver, Blog and so forth so that the effectiveness of the T&L using this platforms can be investigated. According to Holland & Holland (2014), using various technologies tools able to enhance students' interest and motivation as well as provides the prospects to achieve different character of learners. Considering that the respondents were adolescents in urban poverty, they need to cultivate expertise in ICT to prepare themselves for the future job market (Norizan, 2004; Pachler, 2001). This is because the use of ICT could improve productivity and living standards among urban poverty communities. Further, it is recommended that a more in-depth follow-up study is expected to be carried out using other methods such as experimental research, design and development research and so on to survey the acceptance of using ICT in teaching and learning process particularly among adolescent in urban poverty.

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Investigating Teachers' Understanding of the Salt Dissolution Process: A Multi-Media Approach in Education

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ABSTRACT
Animations of molecular structure and dynamics are repeatedly applied to support student comprehension in the theoretical ideas of chemistry. However, students' understanding the dynamics of the phenomena is directly related to the understanding of teachers as instructors. Therefore, this study aimed to investigate how the features of three different molecular level animations are viewed and understood by the teachers who had more than 2-years experience. Participants (n=10) are in-service science teachers, mostly high school, grouped into three groups with four participants in the first group and three people in the other two. Each group viewed short different animations and one common animation demonstrating the salt dissolution process. Teachers were asked to take pre-and post-tests to measure the influence of the animations in their understandings of the content in addition to a group discussion and an interview. The study suggests that the animations improved the content knowledge of the teachers slightly.

INTRODUCTION
Animation as an Educational Technological Tool
Due to the ubiquitous nature of technology, its influences can be seen in today's teaching, understanding, and applications in almost all disciplines. Chemistry is one of these disciplines, and recently technology applications have become a major tool in the teaching and learning processes. With the capability to animate chemical processes on the particle-level symbolization; multi-media tools such as dynamic virtual software programs play a major role in the learning-teaching process of chemistry. Specifically, since dynamic computer software bridges between macroscopic and particle-level demonstration of chemical phenomena, educators frequently apply animation and simulation in teaching chemistry concepts. Some confusion occurs about the definitions of these applications as instructional tools (Pence, 1997). *Simulations* run through mathematical formulas, which enable the tool to calculate and model the phenomena based on the subject principles. The operational definition of *simulation* is the building of a dynamic model and the study of its behavior. According to Lee (2008), as an instructional purpose, a *simulation* is a program that lets a learner interact with a computer representation not only of a scientific model of the natural or physical world but also of a theoretical framework.

Animations are presentation techniques that allow one to depict the outcomes of a simulation. A *computer animation* is "a series of visual images displayed in rapid succession on a computer screen providing the illusion of motion" (Burke, Greenbowe & Windschitl, 1998, p.1658). *Computer animations* represent and combine abstract and concrete dynamic conceptual processes at the microteaching level, thus promoting higher-order thinking skills and deeper understanding (Flick & Bell, 2000). They offer a great variety of perspectives for modeling concepts and processes. They provide a link from students' existing ideas to new knowledge acquisition. In addition, Williamson and Jose (2008) state that particulate animations come in different types: some work through mathematical equations (computational animations), some are imaginative representations of phenomena (representational animations), and others provide users with input into or control of variables (interactive animations).

Teachers' Understanding of Salt Dissolution
The process of dissolution is considerably to be more difficult to visualize since the behavior of molecules and the phenomena happening on a micro level are impossible to see. Visualizing how a solvent disappears, as molecules rearrange in the process is also hard. One can describe dissolution of salt as a breaking of the crystal lattice of salt and forming of an aqueous solution that includes the ions of the atoms and the salt molecules. An educator can animate salt dissolution process in order to demonstrate the reflection of the reality by modeling the molecules' behaviors. In addition, an educator can show the molecular scale view of all processes in a representational animation to help learners understand what happens when an ionic compound dissolves in water.

Studies stresses the importance of the teachers in enabling students to visualize natural topics occurring at micro-level to gain cognitive and conceptual understanding (Roschelle et al., 2000; Surif, Ibrahim, Mokhtar, 2012). Therefore, students' experiencing non-concrete scientific concepts by visualizing the related phenomena is important. Providing non-concrete examples at micro-level is related to the teaching strategy and it is the responsibility of the teachers since the teachers are the actual practitioners of solidifying these concepts (Stronge, 2007). Thus, relating students' difficulties with understanding the salt dissolution process to the explanations and the teaching strategies of teachers is plausible. The better teachers understand and hence introduce the topic to the students, the more comprehensively students might understand the concepts. Lastly, measuring and consequently improving teachers' understanding will increase students' understanding of materials.

Furthermore, teachers are significant factors on enabling students to visualize micro-level natural phenomena in order to provide cognitive and conceptual understanding. With the idea of Technological Pedagogical Content Knowledge (TPACK), educators have begun to overview teachers' attitudes and understanding of a content knowledge without isolating the technology and pedagogy cores of education. Technology as an educational need in this digital age and pedagogy as the practical and procedural component of education interact with one another to help teachers understand a modern effective instruction model. Teachers' attitudes and understanding of the content knowledge is critically important as the teachers should have deeper knowledge fundamentals of subject. Specifically, chemistry teachers need to provide the scientific facts and theories in addition to their practices or representations. For example, providing factual information about atomic theories should be supported by accurate representations to help student visualize the phenomena. Therefore, content in TPACK framework is essential form of teacher knowledge. Based on its importance, measuring and consequently improving teachers' understanding will increase students' learning of materials. This study aims to investigate teachers' understanding of the process in chemistry through an instructional method.

Several studies identify students' difficulties about the connection between sub-microscopic explanations and the macroscopic observations of chemical processes. The authors state that students have problems in working at sub-microscopic and macroscopic levels simultaneously and correctly (Calik, Ayas & Ebenezer, 2005, Chittleborough & Davidowitz, 2009; Gabel, 1999; Liu & Lesniak, 2006; Naah & Sanger, 2012; Smith & Metz, 1996). Moreover, some earlier studies also provided evidence that students encounter difficulties understanding salt dissolution. Cosgrove and Osborne (1981) interviewed secondary students in New Zealand to study the students' conceptions of the solution process. According to the study of Abraham, Williamson & Westbrook (1994), the ratio of understanding the dissolution concept is 27.3 % per 100 students from high school and college chemistry classes. In addition, by conducting individual interviews, Ebenezer and Erickson (1996) identified numerous examples of misconceptions on solubility in 11th grade students. According to the study, students explained solubility concepts as the physical transformation from solid to liquid state or as the chemical transformation of solute.

Hence, students face a challenge in understanding the concepts at different levels. One of the things that we need to check is what teachers know and explain. To detect and get rid of the misconceptions in students' understanding of the topic, revealing the teachers' understanding of the concept is significant. The literature is insufficient to provide information about teachers' understanding of the salt dissolution process, therefore further research is needed.

Research Question

This study aims to investigate teachers' growth in understanding of the process in chemistry through an instructional method. The specific research question is: What is the difference of teachers' content knowledge on pre-to post animation viewing?

REVIEW OF THE LITERATURE

A comprehensive understanding of chemistry requires students to perceive the molecular-level imagination of the phenomena that are happening in laboratory work on a macro level. Instruction in chemistry concepts requires representing processes at particular, macroscopic, and symbolic levels; applying the integration; and moving between these three levels to achieve a deeper understanding in chemistry. Since observation of the behavior of atoms, molecules, and ions is impossible on the macroscopic level, computer applications help to illustrate some concepts by providing visualization through molecular representation of the particulate nature of matter. As a part of these applications, educators use multimedia by combining text, graphics, images, and spatial modeling in chemistry instruction.

Mayer's Cognitive Theory of Multimedia Learning describes the instructional effectiveness of animated visuals and concludes, "Students given multimedia explanations are able to build two different mental representations--a

verbal model and a visual model--and build connections between them" (Mayer, 1997, p. 3). The theory emphasizes the dual (visually and verbally) processing that is required of the students. Moreover, "animations and simulations can depict the dynamic molecular world more effectively than static pictures and words because students are spared the cognitive load of having to 'mentally animate' the content" (Tasker & Dalton, 2006, p. 154). Therefore, deducing that visual information, which is the function of multimedia tools like animations, leads to improvements in the quality of learners' processing information is plausible. If animations help learners to visualize the steps of the phenomena by reflecting reality with the option of auditory narration and text explanation, then the animations yield acquisition of the knowledge better than traditional instructional strategies especially in the topics requiring visualization like many subjects in chemistry. Thus, well-prepared animations that display chemistry topics in succession should assist students' understanding of the molecular concepts.

The use of animations in the chemistry classroom environment has been shown to enhance learning (Appling & Peake, 2004; Ardac & Akaygun, 2005; Barnea & Dori, 1999; Ebenezer, 2001; Kelly, Phelps, & Sanger, 2004; Tasker & Dalton, 2006; Williamson & Abraham, 1995). For example, Ebenezer (2001) has identified computer animations as addressing the conceptualization of chemical processes in students' understanding. Additionally, two researchers in Turkey stated that the most effective way to facilitate understanding the molecular level of chemical processes is integrating animations into instruction (Ardac & Akaygun, 2005). In addition, Williamson and Abraham (1995) examined the impact of animations on students' mental models of chemistry concepts including the solution. The authors concluded that the animations help students to understand the subject matter better, and there are some functions of animations that assist constructing dynamic mental models of chemical processes.

Technological Pedagogical Content Knowledge

By the influence of digital world, students become more familiar to the technological tools. This influence is also seen in practical education since teaching is facilitated by some technological tools. As the new types of tools are emerged in the field, educators discuss technology from the perspective of pedagogy. The researchers investigate the animations, simulations, videos, and static images as new instructional strategies to understand whether the tools are applicable not only for the students but also for the teachers. Mishra and Koehler (2006) combined three domains in education (pedagogy, content, technology) to better understand how to achieve effective instruction in today's classrooms. Pedagogy in instruction and subject knowledge in science as well as the technological applications are seen as main focuses of modern classrooms. Teachers' attitudes and understanding of the combination of these three-focus become central since the teachers have inspirational role in instruction. Shulman's idea (1986) for a blend in pedagogy and content knowledge becomes more meaningful by the addition of technology core since teachers' instruction, interpretation, explanation, conceptualization of subject matter is related to instructional strategies which necessitated technological applications.

Animations from the Perspective of Teachers' Attitudes and Understanding

Teachers' perspectives on the usefulness of animations are significant factors for students' achievement. Teachers' use of animations or their attitudes towards using them is influential in the flow of the lesson and in the students' understanding of the content. One promising finding is that teachers' attitudes toward using multimedia applications have increasingly become more positive (Davidson & Ritchie, 1994; Dupagne & Krendl, 1992; Kellenberger, 1996; Reed, 1986; Wang & Holthaus, 1999; Woodrow, 1987; Yunus, Salehi, & John, 2013). According to Yunus, Salehi, and John's study (2013), 50 of 52 pre-service teachers in Malaysia believed that the use of visual aids could be effectively implemented as instructional tools and create an enjoyable learning environment. In addition, the majority of the teachers had positive perception to the use of visual aids in the classroom, such as animations, since the visual aids arouse students' motivation and help students to comprehend the topic better.

Moreover, a study carries out to investigate Ohio science teachers' perceptions of nine components of computer implementation for instructional use. The study shows that teachers' attitude toward the use of computers as teaching tool is a fundamental step in the use of computers for the educational purposes (Shiverdecker, 2012). Additionally, in the same study, the researcher discovers, "there are differences between the perceptions of teachers who have reached advanced stages of use and teachers who are at lower stages of use" (p. iii). Therefore, figuring out the teachers' understanding of computer-based instructional techniques will assist researchers in understanding students' challenges and improving the quality of the level of instruction.

Teachers' attitudes toward applying multimedia, particularly animations, also relate to the teachers' involvement in the applications. A study that investigates teachers' misconceptions or myths about the use of animations finds, "some instructors do use animations in class, but they simply play them for students with no other reference to the animation or its content. Others assign students to watch animations as homework, but never

refer to them again. In some classrooms, particle-level animations are only used once or twice during the term" (Williamson,
2011, p.72).

Additionally, teachers' attitudes toward using animations in the classroom and their eliciting students' participation are significant. If the teacher offers no explanation during viewing the animation, students perceive features of the animation but may interpret the content inaccurately or may misinterpret the design of the animations. According to Williamson (2011), educators do not use animations effectively when instruction is in isolation. An instructor should be active in assisting students to comprehend the animation simultaneously with instruction.

Lastly, teachers' attitudes and views toward instruction through animations are influential whether the application is used correctly and achieves its intended purpose. The way that teachers use animations in the classroom and teachers' perception about animations reveal their understandings of the related content.

Students and teachers should use animations to teach chemistry concepts. Williamson and Jose (2009) described a number of techniques that guide the learners to form mental images of chemical phenomena at the macroscopic level. Many more research studies mentioned above state the advantages of applying animations in chemistry instruction. Specifically, although many researchers have already investigated the influence of animations on students' understanding of the salt dissolution process, few findings reveal how instructors understand using animations or how the teachers apply the animations as teaching tools in the classrooms. Since the teachers have key roles in applying the method, further studies are necessary to provide more evidence and investigate ways researchers can appropriately demonstrate the method, including how comprehension increases through the use of animations.

METHOD

Participants

The sample consisted of 10 in-service science teachers from a school district near a large
urban district in the southwestern part of the United States. At the time of the study, eight participants taught high school science, and two were middle school science teachers. In addition, the teachers studied a master degree in science education during the time of this research.

The study took place when the teachers join in a pre-scheduled professional development session. All science teachers volunteered for the study; therefore, the session time was extended for the research. The teachers preferred to sit as three in one table, three on another table, and four in the other table. The groups were formed naturally according to their seating preferences. The teachers participated in all phases of the study: pre-test, animation demonstration, post-test, second animation display, group discussion, and a delayed post-test.

Measures

To clarify the design, the researcher describes the measures in three phase. The teachers completed a pre-test before viewing any animation; then they viewed the first animation (different animations for each group) and completed the first post-test (post-test 1). This was the first phase of the study. Right after completing the first phase, the teachers viewed the second animation (same animation for each group) and completed the second post-test (post-test 2). This was the second phase of the study. In this phase, the teachers also answered the question asking what the teachers would use as an instructional strategy while teaching of NaCl dissolving as the last question post-test 2. Lastly, the researcher asked the teachers to make group discussion and then answer the same question about animation as an instructional strategy (what they would use in teaching NaCl dissolving) to understand if teachers' ideas changed about using animation in their classroom. This was the last phase of the study.

The pre-and post-tests were the same in the first four questions, which focused on the content knowledge. Post-test 1 and 2 included an additional question (question 5), focused on the illustrations of the animations. Furthermore, Post-test 2 included one more extra question that pre-test and post-test 1 did not include.

The first item in pre-post tests was a drawing question about molecular-level happenings before and after the dissolution process. The next two questions asked written explanations about the salt dissolution process. The additional last two questions in post-test 1 focused on the content modeling in the animations.

The pre-test was administered to understand the teachers' prior content knowledge; post-test 1 was to evaluate the teachers' content understanding after viewing first animations; and lastly post-test 2 measured teachers' content understanding one more time after viewing the last animation.

The researcher aimed to provide an opportunity for the participants to review their ideas and observations with the other participants' viewpoints by applying a group discussion in each group. The teachers discussed the last question of post-test 2 after completing the test individually. The purpose of the group discussion was to investigate teachers' prior opinions about using animations in their classroom to teach NaCl dissolving. Additionally, after the group discussion, the teachers answered the same question in a separate paper individually. By this mid-test, the researcher was able to compare the differences in the opinions of the teachers before and after they interacted to each other. Therefore, group discussion provided a communication opportunity to the teachers.

Reliability of pre-post measure. The researcher conducted a pilot study to validate the research assessments questions in order to understand if the questions targeted the understanding of the salt dissolution. The sub-group included four in-service science teachers studying for a master's degree in science education and attending a research class within their program. The researcher asked the pre-post questions to the sub-group in order to measure the quality of the answer. The researcher applied inter-rater reliability after scoring the pre-post tests responses based on the rubric. Pearson's Product Moment Correlation between the scores resulted in .83 for the pre-post tests. The *r* value suggested that the tests were appropriate to apply in this research. Lastly, a chemistry professor reviewed the test items and the rubric.

Animations

The researcher used four representative animations of salt dissolution in the study. All animations were chemistry content-based and open to public access. The researcher selected the animations based on the accurate representation of the content and functions of animations such as narration, and audial support.

Animation 1 included a daily life example in the content and molecular level of representation for both soluble and insoluble salts. A short one-minute demonstration also included audio explanation. The url of the animation website;
http://www.yteach.co.uk/page.php/resources/view_all?id=salt_acid_base_water_reaction_product_reactant_precipitation_thermal_decomposition_t_page_12&from=search

Animation 2 had written explanations and an audio option while displaying the representation. A one and half minute demonstration included symbolic modeling of molecules. Water molecules passed through the crystal to hydrate an ion in this animation. The url of the animation website;
http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/molvie1.swf

Animation 3 illustrated the concepts briefly, although it explains the phenomena in general. The animation included some inaccurate explanations. This two-minutes animation went step by step with the support of short text explaining the salt dissolution process. The url of the animation website;
http://programs.northlandcollege.edu/biology/Biology1111/animations/dissolve.html

Animation 4 had better illustration of the content compared to the other animations. Specifically, the illustration of the space between the water molecules in liquid state is less, which was more accurate compared to the other animations. The animation contained some inaccurate representations, illustration of the salt molecules and water molecules during the process of salt dissolution. The url of the animation website;
http://preparatorychemistry.com/NaCl_flash_audio.html

A critique of most public-domain animations is that they lack accurate consideration of the integration of content and pedagogy (Engida, 2014). With this in mind, the researcher selected the three public-domain animations to be used in this study. All four animations included the definition of solubility concept at the micro and macro-level representations; the animations also depicted the interactions and the nature of molecules and ions by the vibrating models proportionately. On the other hand, the animations were public and had some inaccurate representations as mentioned, which could also lead to some misconceptions.

Procedures

This study had a single focus; investigating teachers' understanding of the content from the animations they viewed. The sample of 10 in-service science teachers seated randomly in three groups. Group A consisted of four teachers; Group B consisted of three teachers, and Group C consisted of three teachers.

Table 1. The setting showing the phases of the implementation respectively

Group A	Group B	Group C
Pre-test for all group		
Animation 1	Animation 2	Animation 3
Post-test 1 for all groups		
Animation 4 for all groups		
Pre-test 2 for all groups		
Group discussion for all groups		
Question 7 for all groups		

Note: Group A includes 4, Group B includes 3, and Group C includes 3 teachers.

Each group took the pre-test prior to viewing the animations. The purpose of this test was to assess the prior knowledge of the teachers' content of salt dissolution. After the testing, each group viewed different animations pertaining to the content: Group A viewed Animation 1, Group B viewed Animation 2, and Group C viewed Animation 3. The researcher repeated the animations in each group at the request of the participants. After the animation display, the teachers took the post-test-1. After the post-test 1, each group viewed a common animation, Animation 4 and then took the post-test 2. The last question of the post-test 2 was to write a paragraph regarding the ideas of the teachers about instructing salt dissolution. When the teachers answered the questions, the groups were given prompts to discuss about the content, application of the animations, features of the animations, and the strengths-weaknesses of the animations. After the group-discussion session, the researcher asked the teachers to write a paragraph about how they would teach the salt dissolution to analyze if the teachers changed their opinions before and after the group discussion. The entire testing and animation displays took two-hours in total. Table 1 illustrates the flow of the study.

DATA ANALYSIS

The researcher first analyzed the data descriptively. Powell (1996) explains "some common mathematical techniques that can make your evaluation data more understandable" in descriptive statistics (p. 1). The researcher used basic descriptive statistic method to analyze the data. The focus of this preliminary analysis was to understand and describe the influence of the treatment on the teachers' content knowledge.

The researcher analyzed the teachers' answers to each question separately. To analyze the first question, the researcher assigned certain colors and numbers to teachers' responses in order to quantify and evaluate the findings. Three colors (red, yellow, and green) referred to the accuracy level of the answers. Red indicated incomplete or inaccurate answers and the assigned number was "1." Yellow indicated any positive change, such as an improved explanation to the question on the post-test compared to the explanation on the pre-test and the assigned number was "2." Green showed accurate answers; however, the answers included some misconceptions, lack of inaccuracy, or incomplete explanations to a certain extent and the assigned level was "3." A participant's drawing evaluation is shown in Figure 1. All the other responses in the other questions were also quantified based on the levels in the rubric. The mean scores of the participants are presented for each question separately in the Results section. The researcher used *Microsoft Excel* to calculate the descriptive statistics by the scores of the teachers' assessments.

RESULTS

The findings are presented in three sections. First, questions 1-6 on the test are examined as they indicate a change in content knowledge. This is followed by the findings from Question 7 and the discussion.

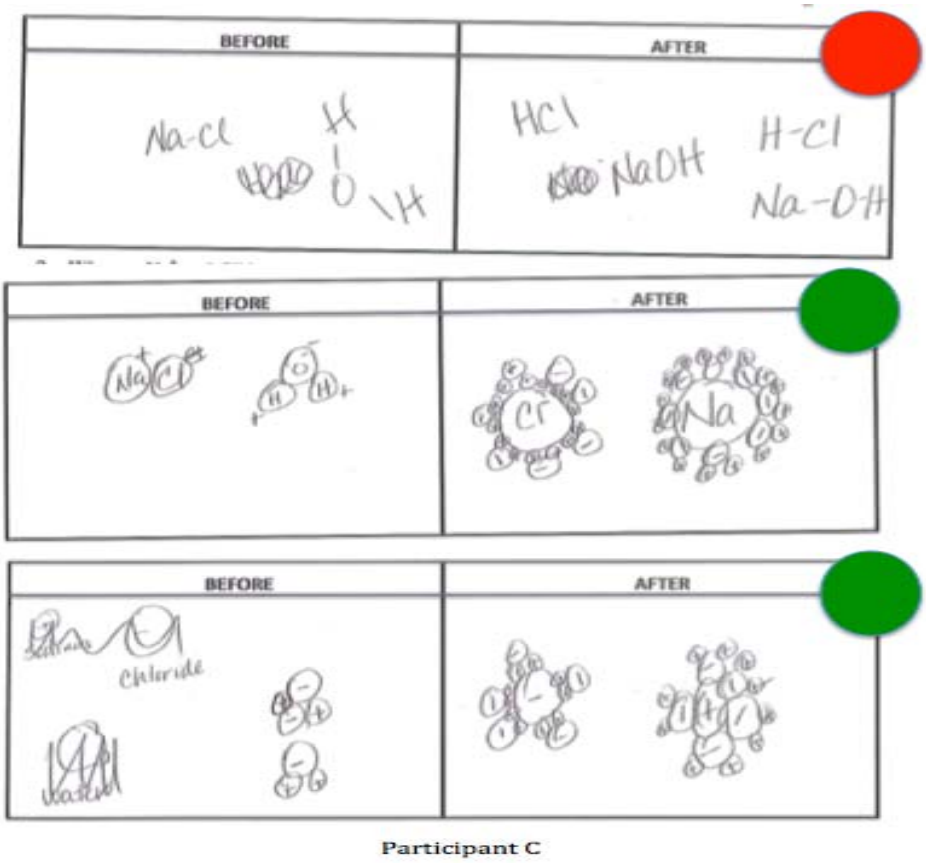


Figure 1. A participant's drawing of the process at molecular level for Question 1

Question 1: Drawings reveal the understanding of a phenomenon in a visual form is significant. The question asks teachers to draw an illustration about the salt dissolution of NaCl at molecular level before and after the dissolving process. The focus is on teachers' understanding of the content provided by the animations as analyzing the findings. The researcher compares the first drawings in the teachers' pre-test, post-test 1 and post-test 2 to detect the changes in teachers' understanding, and observes positive changes in general. Some teachers' drawings remain the same, but the findings do not inform about any negative change.

In Group A, four teachers' drawings exist for the first question. Two teachers remain the same in their drawings from pre-test to post-tests. One of these two teachers shows an improvement in post-test 1 compared to his drawing in pre-test, however; some serious mistakes put the participant in the same color level. The other teacher improved after viewing the second animation. One of the participant's drawings are shown in Figure 1. The order of the drawings is the order of pre-to posttest 1 to then posttest 2 applications: before viewing any animation, after viewing Animation 1, and after viewing Animation 4. The participant draws symbolic representation before viewing an animation, progresses by drawing molecular representation after viewing Animation 2, and keep the progress and draws the process similarly after viewing Animation 4.

Table 2. Each participant's mean scores for question 1

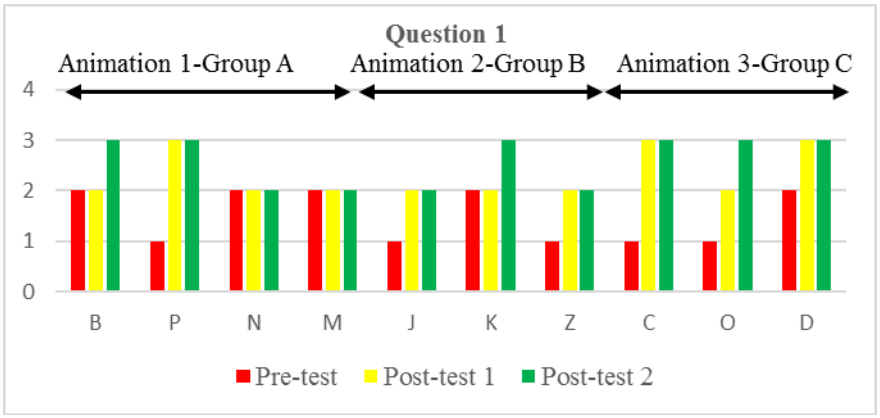
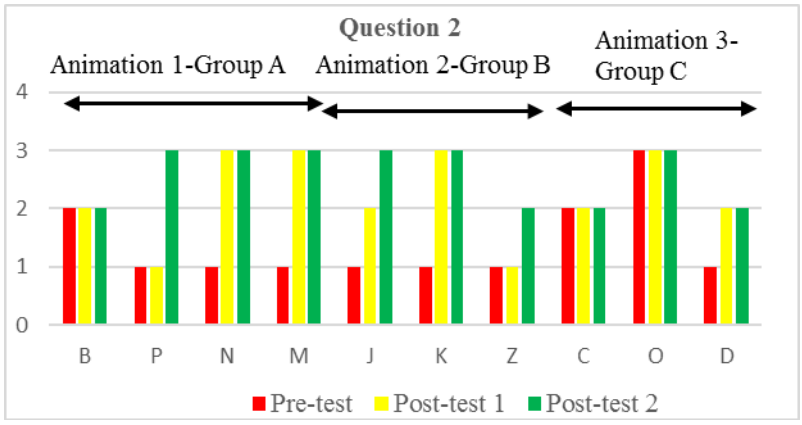


Table 2 shows the findings of the first question. The letters on x-axis represent the participants and each bar represents one of the test scores of the teachers (pre, post-1, post-2). First four letters represent the teachers in Group A, the next three letters are for Group B, and the last are for Group C. As shown in Table 2, three participants in Group B who viewed Animation 2 have positive changes in their drawings which means that most of Group B members improved in representing the process visually. Similarly, Group C also shows sharp improvements at molecular-level illustration of salt ionization in an aqueous solution. The teachers in Group C make a significant progress when they view the animations especially when watching Animation 1.

Table 3. Each participant's mean scores for question 2



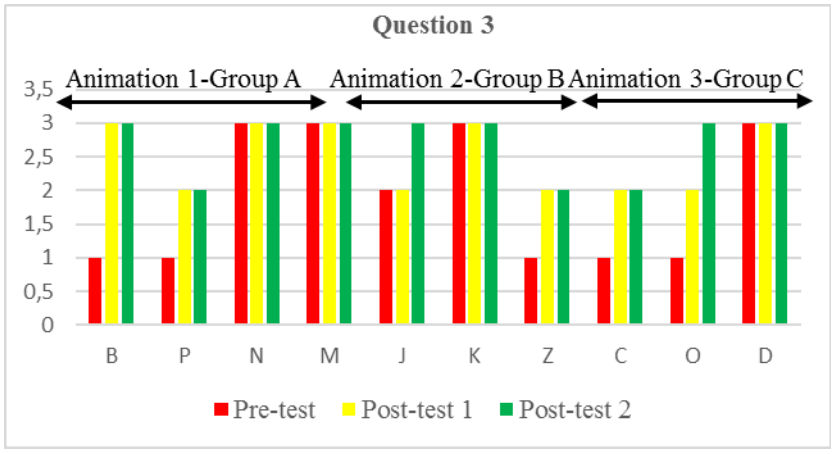
Question 2: The question asks why Na^+ and Cl^- ions disjoin from each other in solution. Salt dissolution occurs by the separation of Na^+ and Cl^- ions from the salt crystal. Partially positive sides of water molecules, which are hydrogen sides, attract the negatively charged chloride ion, and partially negative sides of water molecules, which are oxygen sides, attract the positively charged sodium ion.

With the second question of the tests, the researcher sought to understand whether the teachers are knowledgeable about the reason for the separation that is the fundamental part of the process. Table 3 shows the findings of the second question. People in Group A and Group B make strong progress after watching the animations; however, the teachers in Group C do not show similar findings but still improve in general after watching the animations. The average level of the groups ranges from 1.5 to 2.3 and then to 2.5. The range indicates a sharp increase in after the teacher viewed the first animation and some more progress after they view Animation 4. Even, the first representation of the process improved their understanding of the salt dissolution process at molecular level.

Question 3 asked if there was a significant interaction between the Na^+, Cl^- ions and water molecules. The aim of the question was to understand what the teachers thought about the strength between ions and water molecules interaction in an aqueous solution. Bonding and interactions occurred within and between the molecules such as covalent bonding. Though a strong nonpolar bonding, covalent bonding was relatively weak between molecules.

Instead Van der Waals played significant role in attaching the molecules and ions. Table 4 shows the findings of the third question. The average levels of Group 2 ranged from 1.9 to 2.5 and, then to 2.7, indicating a sharp increase after the teacher viewed the first animation and also showed some more progress after the second animation, which was very similar to the findings of the second question. Salt dissolution included dissociation and interaction of particles. Sodium chloride dissolved in water, and the sodium and chloride ions formed a lattice crystal when the formation of ionic bonds occurred. Water molecules surrounded the ions according to their charges. The water molecules pushed the Na^+ ions farther away from the solids, and the other water molecules moved between the escaping ion and the solid disrupting, the attraction to chloride ions still on the surface of the solid. The same steps led to chloride ions; water molecules pushed them farther away from the solids.

Table 4. Each participant's mean scores for question 3



The process went on until all the ionic bonds break and ion-water molecule interactions occurred, thus salt dissolution completed. However, teachers did not generally answer the fourth question in the way that the researcher intends. The question was about the molecular level steps of the process; however, the teachers answered the question as if the process consisted of the steps in preparation some salt solution in a laboratory experiment. To exemplify, the response in the rubric for question 4:

Q4: In a mixture of NaCl and water;

1. *Each water molecule collides with the NaCl solid.*
2. *Na+ and Cl- ions; the oxygen sides of water molecule push the Na+ ion farther away from the solid, and hydrogen sides of water molecule push the Cl- ion farther away from the solid.*
3. *Each Na+ ion is surrounded by six Cl- ions, and each Cl-ions is surrounded by six Na+ ions.*
4. *Other water molecules move between ions and the solid, disrupting the attractions to the solid.*
5. *The Na+ and Cl- ions, and water molecules move in the solution like any other particle in the liquid.*

However, one of the participants answered as, "Agitate the solution with a lab tool (spoon). Raise the temperature by placing it under a hot plate. Decrease concentration of NaCl and increase H_20; this way more H_2O molecules surround NaCl." Another teacher stated similarly, "Get a beaker, get a stir rod, fill the beaker with water, add the NaCl, stir with stir rod." The participants mostly answered this question similarly.

Question 5 asked the teachers to decide if the given statements in the question were correct or wrong. The first statement of the fifth question in the assessment (Appendix A) asks that ions were the same size as the atoms they came from, only to visualize that they were different ions. The answer should have been "false" since the ions' sizes were different than the size of atoms they came from. Five participants answered the statement correctly on pre-test. Three more teachers answered correctly after viewing the first animations, and eight out of ten teachers answered correctly at the end. The Na atom was smaller than the Na ion and the Cl atom was bigger than its ionic form. The second statement was, positive ions were smaller than the atoms they came from and negative ones are bigger. This statement directly connected to the first statement; however, the second one focused on the size of atoms and ions relative to each other. The right answer was "true" for this statement, and four teachers out of ten answered correctly to the statement on pre-test. One more teacher answered correctly after viewing the first animations, and six out of ten teachers answered correctly at the end. The phenomenon in the statement was apparent in all the presented animations and the image given in the question. The third

statement of the question asked if the modeling did not have any meaning, and if the ions/atoms were the same size. Chart 1 shows the overall findings for each participant.
Additionally, in the fifth question, Chart 1 showed the scoring of the teachers' responses. The researcher assigned random letters to the participants, shown in first column. In the chart, if the number of wrong answers to the statements was less tan two, the researcher painted the question yellow and assigned "2" to the yellow colored answers out of three. The researcher used green if the participant had no wrong answer to the statements. If two or more wrong statements occurred, the researcher colored the question red, and assigned "1" to the answers.

Chart 1. Teachers' scores in question 5

QUESTION 5		PRE-TEST	POST-TEST 1 ANIMATION 4	POST-TEST 2
GROUP A	-B-	2	2	2
	-P-	2	1	2
	-N-	3	3	3
	-M-	3	3	3
GROUP B	-J-	2	2	2
	-K-	3	3	3
	-Z-	1	1	1
GROUP C	-C-	3	3	3
	-O-	3	3	3
	-D-	1	2	1
AVERAGE		2.3	2.3	2.3

For example, Participants P made more wrong statements after the first animation but returned to the correct one after the teacher watched the second animation. Similarly, Participant D made fewer wrong statements after the teachers viewed the first animation, but made more again after the second animation. Three participants thought that the ions were the same size of the atoms they came from, and those participants did not change their answers even after the teachers watch the animations. One of the participants changed the answer to a correct statement, saying the positive ions were smaller than the atoms they came from and negative ones were bigger. Only one teacher answered the statement c, saying the modeling did not have any meaning and the molecules were the same size, which is wrong. Overall, the teachers did not change the answers to the statements and questions even after the animations. Lastly, all participants but one answered the last statement correctly.

Question 6 asked if the animations should have included any of the given ideas in order to improve the reflection of the reality. The sixth question appeared only in the first and the second post-tests since the question addressed the content of the animations rather than learning that occurred as a result of watching the animations. In other words, the aim of the sixth question was to investigate teachers' understanding of the mechanic features of the animations. For example, if the size of circles referring to the ions/atoms in the animations represented the accurate knowledge. The way that the animations demonstrated the phenomena differed in each. Coloring, size depiction, motion flow of the molecules, and the process itself, the spaces between the molecules and ions, interaction and bond illustration were some examples of differences. Determining if these aspects of the animations helped the learners to understand that the phenomena were important and if so which one(s) teachers used and reflected our understanding of reality. The suggestions followed: the angle between the atoms in molecules should be relative to the real angles; modeling of atoms and ions should be in equal spheres; spaces between molecules should be equal to each other, and bonding and intermolecular forces should exist in modeling.

First statement: The angle between the atoms in molecules should have been adjusted according to real angles. Wu, Krajcik, & Soloway (2001) state that the angles between the atoms in molecules need to be relative to the actual angles. Representing the actual angles in a modelling was possible by establishing a relativity between the angles of molecules in modeling. In this study, four teachers agreed with the given statement and the rest did not mark it as true.

Second statement: Coloring should be removed and all molecules should be in same color or colorless. The studies in the literature supported the idea of coloring the atoms in modelling in order to differentiate atoms.

Coloring or drawing different geometrical shapes were the methods to identify different atoms and separate them from each other in a modelling of a chemical phenomenon. Eight of the participants disagreed with the given statement since coloring helped to visualize the difference between the atoms.

Third statement: Atoms and ions should be modeled in equal spheres. The studies about modeling in science supported establishing a relativity with the reality in representations. Therefore, modeling Cl^- ion (higher electronegativity) in a smaller geometrical shape compared to Na^+ ion (lower electronegativity) illustrate the suggested representation. Eight participants out of ten state that atoms and ions should not have been modeled in equal spheres, since they were not the same size in reality, which aligns with the suggested representation.

Fourth statement: Spaces between molecules should be equal to each other. Considering the suggested idea of establishing relativity with the reality, spaces are better to be illustrated at different distribution since the space between the molecules are not equal even in homogenous solutions. Six teachers think that space between the molecules in a solution varies, but not constant, which aligns with the suggested idea.

Fifth statement: Bonding and intermolecular forces should be illustrated in modeling. In order to reflect reality in modeling, bonding and intermolecular forces can be illustrated. Eight teachers out of ten agree the idea of adding the illustrations of bonding and intermolecular forces in to the modeling. Two of them think that this addition make the illustrations look too busy; not a good idea to add these forces into the modeling.

Group Discussion

The last question, which appeared only in the post-test 2 sought to determine teachers' prior ideas about their instructional teaching of NaCl dissolution. After the second post-test, the researcher asked the participants to discuss the role of the animations in teaching, and also the aspects and the content presentations of the animations. Teachers kept the groups that they formed in this study, Group A, B, and C, and the discussion took place between the group members. The aim of the group discussion was to measure the difference of the teachers' ideas on the strategy that they would apply for teaching the topic in their classrooms.

Participants in Group A did not change their opinions after the discussion session; two of them determined to use animations in their instruction before and after the group discussion. One of the participants chose not to apply animations since he disagreed the idea that animations improved students' learning of the content. The other participant referred to the use of multimedia application in his classrooms but not specifically animations even after the group discussion. Two participants in Group B changed their minds and decided to use animations in their classrooms and the third participant kept thinking about applying animations. Only one participant in Group C did not consider applying the animations in the classroom, and after the discussion, the participant changed her mind and stated that she applied animations while teaching salt dissolution topic to the students.

DISCUSSION

The first six questions gave insight into the value of animations for helping students develop conceptual understanding. The discussion provided more information about teachers' opinion about using animations in the classrooms.

Visual Aspects of Animations Help

First Question: Studies reveal that different representations have distinctive attributes that both guide and constrain what learners do and come to understand (Ainsworth, 2006; Scaife, & Rogers, 1992; Tversky, 2011). Considering this indication, the researcher asked the first question to measure the difference between drawings before and after watching each animation. Group A watched the shortest animation; the molecular representations were not as large as the ones in the other animations. The disadvantages of the Animation 1 could account for the slight improvement of Group A comparing to the improvement in the other groups. For example, Teacher M in Group A drew the salt in two dimensions, but changed the model to three-dimensional shapes after watching Animation 4. The teacher kept drawing inaccurate demonstrations after viewing Animation 1 but fixed after viewing Animation 4. Therefore, Animation 1 did not help to fix the inaccurate understanding whereas Animation 4 helped to improve teachers' understanding about the accurate and consistent molecular demonstration. On the other hand, the progress that teachers in Group B and C showed the quality of the animations compared to Animation 1. Animation 2 and 3 demonstrated the molecular-level demonstration in a slow pace so that the participants had time to view the process in detail. In conclusion, Animation 4 supported the improvement the most because it included the most accurate demonstration, teachers' understanding strengthened after viewing Animation 4. In addition, the length in Animation 2 and 3 increased the time required for teachers' understanding of the process. For example, in Group B, Teacher Z drew the salt crystal as separate NaCl molecules, and changed the modelling in her drawing to the modelling of the animations. The participant

separated the molecules rather than depicting them as clusters, which was also visualized in the animations so that the teacher adopted the demonstration into her drawing. In general, the improvement in drawings implied that the molecular representations of the animations influenced the participants' drawings significantly. The important deduction from the drawings is that Animation 2, 3, and 4 without further instruction improved teachers' understanding of salt dissolution process in general at molecular-level in this study.

Second Question: The researcher used rubric to score teachers' responses. In the second question, teachers' understanding of content increased after the they watched the first animations. Question 2 asked the participants to explain why Na^+ and Cl^- ions disjoint from the salt crystal. All animations presented the molecular-level modelling of ions and molecules and demonstrated the changes during the dissolution process accurately. Since the animations represented the separation of the ion from the salt crystal through dynamic representations successfully, teachers showed progress in answering to the question without any further instruction. Separation of the ions is the core part of the phenomenon and having a clear understanding of this part requires visual adjunct such as animations. For this question, regardless of the aspects of animations (time length, quality of visual representation, narrative or audial support, etc.…) teachers improved even after viewing the first animations. The finding addresses the need for visual representations in teachers' understanding of the content at molecular level.

The first two questions of the test were different than each other in terms of assessment type; the first one was a drawing and the second one was written-based question. The answers to these questions in each group improved regardless of the way teachers expressed their knowledge. Therefore, this improvement refers to the influence of the explanations and representations of the animations that the teachers viewed.

Content Understanding from the Animations with Certain Aspects Differs

Third Question: In this question, specifically the teachers in Group B did not show as much improvement as the teachers in Group A. Animation 1 (Group A) included a molecular-level example to soluble salt. This daily-life example helped teachers understand the concept in a way that those teachers overpassed the teachers in the other groups. As many researchers state, the existence of daily life example in an instruction or demonstration is important in content understanding. With the insoluble salt example, Animation 1 presented the interaction between the ion and the water molecules. It also provided an opportunity to visualize and compare on how an interaction could take place between the molecules. On the other hand, Animation 2 (Group B) included only the interaction in the demonstration, but not emphasized the interaction by presenting insoluble salt which was a compare-contrast example for the teachers. Therefore, teachers who viewed Animation 1 benefitted of the animation more than the teachers who viewed Animation 2 because of the difference in the quality of content presentation of the animations. Similarly, Group C improved more after watching Animation 3. However, interestingly, Animation 3 did not include the reasoning for an insoluble salt. Therefore, these two teachers had the understanding about the interaction between the ion and the water molecules prior to view the animation. Nevertheless, the visuals showing the process between the molecules could have been explanatory for the teachers in visualization of the interaction between the ions and the water molecules. In summary, the first animations helped teachers understand the salt dissolution process better based on their different features of representations. In general, including daily life example, presenting reasons of the phenomena, and visual representation aspects help teacher understand the process better.

Fourth Question: Most of the participants did not answer the fourth question in the way the researcher intended with this question. Emphasis on molecular-level descriptions in explaining the salt dissolving process was missing in the question. All the animations except Animation 4 explained the the description of the process in the order. Animation 1, 2, & 3 demonstrated the macroscopic view of the process before salt and water interacted at the beginning. Next, the animations showed how they interacted and which atom attracted which ion in detail. Among these three animations, only Animation 1 was comparatively speedy so that viewers could have missed the attraction between the atoms and ions. However, the order in the interaction was clear in all except Animation 4. Animation 4 was the common animation and missed the macroscopic view of the process. Therefore, the participants could have been confused about the order of the process because of the missing macroscopic level demonstration as well as the crowded nature of the animation.

Teachers' Preferences and Perceptions about Visual Representation of Dissolving Differ

Fifth Question: Studies in the literature suggest to apply relative reality in representations, which implies not to include coloring in the model molecules. In the context of this study, coloring in the animation was only to depict different atoms, and identify different atoms in representations. If the models were in the same color, confusion could occur. The emphasis on the fact that coloring is only to model and differentiate atoms in the animations but does not exist in reality might help students to understand the animation in reality.

In this study, one of the eight participants agreed to include coloring in animations and stated, “Even though the colors are not real they make the animation easier to understand.” Another participant stated, “Coloring can help to see the process better, so keep it colored.” Teachers were mostly aware of the fact that in reality coloring did not exist. All the animations that the teachers watched was colorful; therefore, a comparison between the ideas of the teachers depending on the animations they watched is not a pic for discussion. The next statement was, “modeling of the atoms and ions should be in equal spheres.” Ions and atoms are not the same size in reality, so not equal to each other. Modeling the molecules in equal spheres might lead to the understanding that all atoms and ions are equal spheres. One of the eight participants who agreed with illustrating the atoms and ions in different sizes stated, “the difference in shapes and sizes help with identification.” Teachers also were aware of the difference between the sizes of ions and atoms, and supported to illustrate them in different sizes in the representations. Additionally, all the animations depicted the relative size of the molecules accurately.

Furthermore, the drawing question (first question) in the tests, was also related to the modelling in the fifth question. The answers to the modelling statement was associated to the drawings of the participants. When compared drawings to the teachers’ statements about the size of the atoms, an interesting point was revealed. The first two statements in the fifth question was about the size of the atoms and regarding the charge of the ions. “Positive ions are smaller than the atoms they come from and negative ones are bigger” was the statement related to size of the molecules.

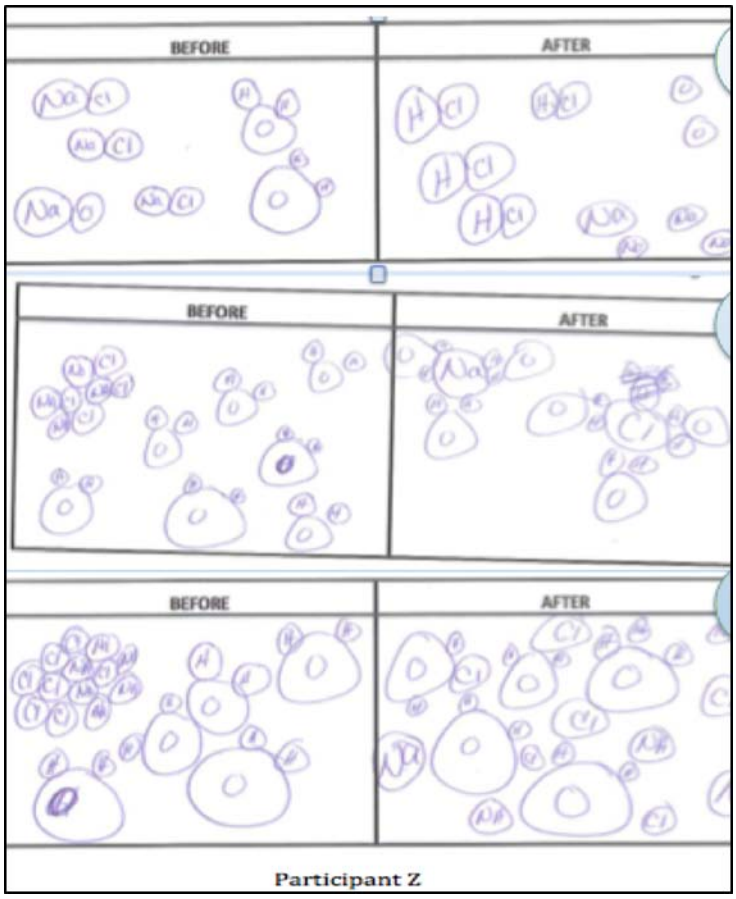


Figure 2. Drawing of Participant Z

Participants who agreed with this statement were expected to apply the written statement in their drawings. Therefore, the participants were expected to draw a bigger model for Na atom in the salt crystal but relatively smaller in the aqueous solution. However, they did not. According to the findings of the study, none of the participants paid attention to their drawings in terms of the size of the model molecules before and after viewing the animations. Figure 2 shows the drawings of a participant. The inconsistency between the content of the drawing and the statement of a participant was apparent in the drawings. The majority of the drawings of the participants were similar on this inconsistency.

The sixth question was also related to animations’ illustrations of the content, specifically demonstration of

the angle within the water molecule, space between the molecules and ions, geometrical shapes of the molecules and ions, and the bonding representations. Therefore, drawings of the teachers could be compared to their statement to check whether they understood and applied the content or the understanding was in-surface.

The spaces between the molecules were not exactly equal for each molecule even if the solution is homogeneous. Therefore, these two teachers could have misconceptions about the process at molecular-level. Animation 3 was incomplete in representing the macro-level perspective of the phenomenon; it also lacked accurate representation about the spaces between the molecules before and after the salt dissolution process. This misrepresentation could account for the inaccuracy in the statements of the teachers in Group C. Animation 1 demonstrated the happenings before and after the salt dissolution process accurately in terms of the space between the molecules. Therefore, the teachers in Group A had opportunity to compare the spaces in both soluble and insoluble salt and water mixtures. When compared their drawings into their statements, all teachers even Group C drew unequal spaces between the molecules with or without purpose. Two participants in Group C did not support to have colors in animations. To explain the difference between a colored and non-colored animation, it would be good to have an animation with no color.

In that way, teachers would also have an opportunity to compare them. However, the animations were all colored. Even though this was the case, all the other teachers supported to have colors to differentiate the atoms from each other.

The last statement suggested to include the representations of bonding and intermolecular forces in to the animations. In fact, to see the bonding and all the intermolecular forces between the molecules and ions in the animations is helpful; however, the animations represent the phenomena in many ways, such as relative sizes of atoms and ions, motion of the particles, different identity of them and chemical bonding within the compounds. If the other interactions like intermolecular forces were to be included, the animations would become more complex and harder to concentrate the happenings. Illustrating intermolecular forces would help students to see attractions between the molecules comprehensively, in order to demonstrate the salt dissolution phenomena clearly, animations were better to exclude bonding and intermolecular forces. However, eight of the ten teachers disregarded the idea of inclusion of the bonding and intermolecular forces to congest the modeling. Two teachers supported to include the intermolecular forces but interestingly exclude any representation of intermolecular forces or bonding in their drawings.

To summarize, the findings in this preliminary study indicated that animations providing accurate demonstration about molecular representations as well as providing enough time for the audience to understand the happenings in demonstrations supported teachers' content understanding consistently. In addition, daily-life example presentation strengthened content knowledge of the teachers. Lastly, the features of the animations such as coloring and slow pace, the angle and size representation of the atoms and molecules were different but teachers were mostly aware of the accepted ideas in chemistry.

Teachers Like Animations

The open-ended nature of the of the written response to question 7 and the discussion that followed provide additional insight into the value of using animations for helping teachers develop conceptual understanding. Question 7 followed the demonstration of the animations; which teachers would or would not prefer to apply in their own classroom. The open-ended nature of the question helped the researcher understand whether the teachers liked the animations and thought that the animations were useful or not. Most of the teachers thought that they would apply the animations in their classroom as instructional tools, which suggested that they benefited of the animations so that they liked their students to benefit of them. The improvement in the mean difference between the pre-post tests also verified the idea that the teachers benefitted of the animations in terms of content learning. Therefore, teachers were ready to use animations in their classroom if they were given the resources. Professional workshops might focus on the effective use of animations and provide different resources about the animations in different subject matters.

Group discussion opportunity was presented as an option to clarify their understanding of using animations or the content presented by animations. Observing the teachers trying to reason their viewpoints about why animations could help students' understanding was one of the expected benefit of the discussion. Their reasoning about applying animations were directly associated with the modelling features of animations and the animations' possible influence on students' content knowledge. The teachers in this preliminary study supported using animation in classrooms because of its graphical aspect other than the content presentation. Teachers did

not only improve by the help of animations but also attempted to convince each other that the animations would help their students' content understanding.

This repetition also supported that teachers found the group discussion as a chance to reason and explain why and how they benefited of the animations as well.

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APPENDIX

Pre-Post Test

(Pre-test includes only questions 1,2,3, and 4; Question 5 & 6 are only in Post-Test 2; Question 7 is the instructional strategy question)

1- Please draw the NaCl and water molecules in molecular level before and after dissolving.

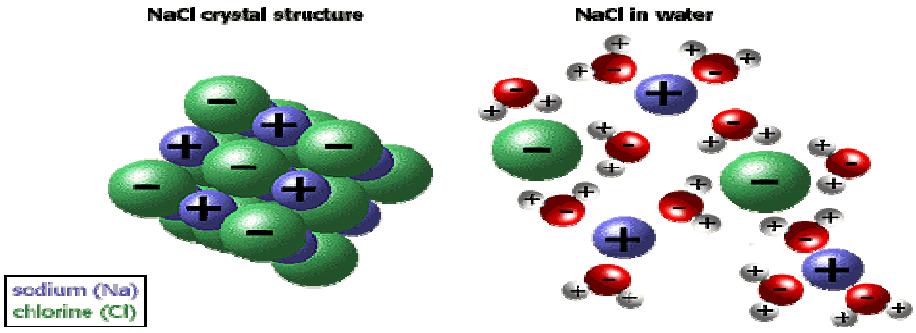
BEFORE	**AFTER**

2- Why are Na^+ and Cl^- ions separated from each other in solution?

3- Is there a significant interaction between the Na^+, Cl^- ions and water molecules? Explain.

4- List 5 important steps in dissolving NaCl in water. Please write one sentence per step.

5- Based on the image above, which of the following(s) are correct statements?



a) Ions are the same size as the atoms they come from but it is only to visualize that they are different ions.
b) Positive ions are smaller than the atoms they come from and negative ones are bigger.
c) The modeling does not have any meaning. They are the same size.
d) Liquid water is correctly portrayed

6- Which one(s) of the following ideas should be applied to the animation in order to improve the reflection of the reality? Please write one sentence per item.

- The angle between the atoms in molecules should be adjusted according to real angles.
- Coloring should be removed and all molecules should be in same color or colorless.
- Atoms and ions should be modeled in equal spheres.
- Spaces between molecules should be equal to each other.
- Bonding and intermolecular forces should be illustrated in modeling.

7- Please write a paragraph on what would be your instruction approach in teaching NaCl dissolving?

Investigation Faculty of Education Students' Cyberloafing Behaviors in terms of Various Variables

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ABSTRACT
Today, internet-based information technologies are sine qua non of effective learning and teaching. By the use of multiple multi-media tools in education, learning environment is enriched, persistence of learning is ensured and the boringness of the course is prevented. However, the purposeless use of internet in classrooms leads students to get disconnected from the course and become distracted, the prevention of motivation, and discipline problems.In particular, the facts that smart mobile phones have become widespread and students come to classroom with their mobile phones can lead to the spread of cyberloafing behaviors during courses. The cyberloafing behaviors in education refer to the fact that students use the internet within course hours for the things irrelevant to course. This research aims to investigate the states of showing cyberloafing behaviors in these courses of the faculty of education students taking Computer I and II courses. The students taking computer I and II courses in different departments of Fırat University Faculty of Education and 1st and 4th grade students in the Computer Instructional Technologies (CIT) department constitute the study population of the research. According to research findings, although students stated that the idea of being engaged in cyberloafing during the course cannot be accepted, it was concluded that they followed their e-mail, participated in discussion groups, and that further cyberloafing behaviors were shown by male students in terms of gender variable, the students in the upper class in terms of class variable, the students who are experts in using the internet, those with more internet seniority and those with personal computers.

Keywords: Cyberloafing behavior, Faculty of education students, Social networks, computer laboratory.

INTRODUCTION

In today's world, internet technologies along with computers, tablets and smartphones have become a part of everyday life(Adalıerand Balkan, 2012; Çınar and Karcıoğlu, 2015; Panicker and Sachdev, 2014; Lim and Teo, 2005, Akca, 2013). Internet technologies are used in public institutions, commercial centers, streets, houses and in all parts of the life. The ratio of households with internet access throughout Turkey was 69.5% in April 2015 (TUIK, 2015).Internet usage turns into internet addiction especially in youngsters. Many factors such as gender, age, having access to internet at home, school, social and psychological reasons, loneliness and the fact that internet is a social communication tool can affect internet addiction (Esen and Siyez, 2011; Uneri and Tanıdır, 2011; Sarıkaya and Seferoğlu, 2013; Taş, Eker andAnli, 2014; Yılmaz and others, 2014).

Internet technologies increase the efficiency and effectiveness in the workplace when they are used purposefully but they may cause loss of data when they are used out of purpose (Stanton, 2002: Ugrin, Pearson and Odom, 2008; Garrett and Danziger, 2008). The use of internet for the works which are outside of the organizational objectives can be defined as cyberloafing behavior. Cyberloafing is expressed by the terms such as “cyberslacking”, “cyberdeviance”, “cyberloafing” and “cyberbludging” in the literature (Yıldız et al., 2015). Cyberloafing is defined as the use of internet and e-mail for non-business purposes at the workplace by Blanchard and Henle (2008), as the fact that employees use the internet at the workplace by their will for personal purposes during the working hours by Lim (2002), and as spending inefficient time on the internet by Ugrin, Pearson and Odom (2008). Blanchard and Henle (2008) state that insignificant cyberloafing behaviors at the workplace are quite a lot. Aftab (2003) states that the absence of Internet quota problem, high speed internet access at the workplaces and economic reasons may lead staff to show cyberloafing behaviors(Yağcı and Yüceler, 2016). Some authors divide cyberloafing behaviors into two as insignificant and serious cyberloafing behaviors. It is stated that insignificant cyberloafing behaviors are the use of e-mail, looking at general news and finance sites, making online shopping and entering auction sites; serious cyberloafing behaviors are entering gambling sites, reading blogs, downloading music, editing, personal web pages and entering chat rooms (Blanchard and Henle, 2008; Lim,2002).Employees who are engaged in insignificant virtual loafing activities consider their behavior as an ordinary situation and think that these activities do not damage to business

resources and even could be useful in some aspects such as preventing stress (Andreassen et al., 2014; König and Guardia, 2014).In addition the benefits of cyberloafing behavior such as relieving the employees, it has some drawbacks such as the disruption and delay of the works, unproductiveness at work. Therefore, the fact that employees show cyberloafing behaviors which are considered insignificant when they are free is acceptable.

One of the areas where internet is intensively used is the education sector. Along with the introduction of internet in the Computer Laboratories (IT) in schools, abuse of internet is observed especially in ill-defined computer courses. When we make a definition of cyberloafing for education, it can be defined as the students' tendency and/or behavior to use internet for the things irrelevant to the course during course hours (Kalaycı, 2010: 13–14). Brubaker (2006) states thatcyberloafing behaviors are also shown by students in IT laboratories and these behaviors could lead to various problems (Young,1998).The fact that students tend towards out of purpose activities during the courses leads them to get disconnected from the course, the reduction of their motivation and discipline problems. The fact that the computer courses are conducted in line with the purpose in faculties of education training teachers is important for prospective teachers not to have undesirable behaviors. This study aims to determine faculty of education students' state of showing cyberloafing behaviors in computer laboratories and whether their state of showing cyberloafing behaviors differ by students' various characteristics.

For this purpose, answers to the following questions will be sought:

1. How do faculty of education students perceive cyberloafing behaviors in computer laboratories?
2. Is there a significant difference between faculty of education students' gender, department, grades, grade point averages, internet usage skills, internet usage seniority, access to the internet and the variables of whether students adopt cyberloafing idea and the perceived cyberloafing behaviors?

METHOD

In the study, it was aimed to investigate the relationships between the variables. Therefore, relational research model was used in the study. Fırat University Faculty of Education students constitute the study population of the research. The random and disproportionate cluster sampling methods were used in the research. Information about the students who participated in the study are shown in Table 1

Participants

Table 1. General information about the participants

Department	**Class**	**f**
Computer and Instructional Technologies **(CIT)**	1–4	51
Religious Culture and Moral Knowledge Teaching (**RCMKT)**	2	37
Social SciencesTeaching**(SST)**	1	45
ClassroomTeaching**(CT)**	1	21
ScienceTeaching**(ST)**	2	18
TurkishTeaching**(TT)**	2	30
Mathematics Teaching **(MT)**	1	30
Total		232

A total of 232 students including the students taking Computer 1 and 2 courses in the Faculty of Education and CIT 1 and Grade 4 students constitute the sampling. The number of students in the specified departments is 413. Thus, sampling constitutes 56% of the study population.

Instruments

Perceived Cyberloafing Scale created by Blanchard and Henle (2008) was translated into Turkish by Kalaycı (2010). Cyberloafing Scale is a 5 point likert scale. The scale consists of 13 items and 3 factors.These are Individual works, Socialization and News following dimensions. The data of the Exploratory Factor Analysis of the scale are presented in Table 2.

Table 2. Reliability analysis of the perceived cyberloafing scale

Dimension	ExplainedVarianceratio	Cronbach α
Personal –relatedWork	41.58	.83
Socialization	12.82	.85
News reading	8.37	.66
Total	62.76	.88

The goodness of fit values were found as [$\chi 2$ (62, N=205) = 106.24, p<.000, RMSEA= 0.059, S-RMR= 0.052, GFI= 0.93, AGFI= 0.89, CFI= 0.98, NNFI= 0.97, IFI= 0.98] in the second level confirmatory factor analysis by

Kalaycı (2010). It is seen that these values are in accordance with the fit indices. In this study carried out, overall reliability coefficient Cronbach's alpha coefficient of the scale was determined to be ,815.The data collection tool used in the study consists of 2 sections:

*Personal Information Form:*It includes items such as students' gender, grades, grade point averages, internet usage frequency, for how many years they have used the internet, ability to use the internet, the place of accessing the internet.

*Perceived Cyberloafing Scale:*The activities that can be done on the internet during the course and students' frequency of doing these activities were asked in the measuring instrument.

Data analysis

Whether data showed a parametric structure was analyzed by Kolmogorov Smirnov NPar test. As a result of the test statistic, it was understood that z points of the items varied between 2,47-6.669 values and $p<.05$ level of all items was significant. Therefore, nonparametric statistical techniques were used such as MWU in the comparison of two variables and KWH test in the comparison of more than two variables. Both techniques belong to nonparametric statistical techniques and are frequently used in social sciences (Büyüköztürk, 2011).

RESULTS

In this section, the findings obtained from the analysis of data collected from students are given in as tables and reviewed.

Table 3. Distribution of Students' Personal Characteristics

			f	%
1	Gender	Male	130	56
		Female	102	44
2	Class	1st class	131	56.5
		2nd class	85	36.5
		4th class	16	7,00
3	Semestergrade	1.50–1.99	9	3.9
		2.00–2.49	25	10.8
		2.50–2.99	85	36.6
		3.00–3.49	54	23.3
		3.50–4.00	11	4.7
4	Internet usagefrequency	Daily	87	37.5
		A fewdays in a week	105	45.3
		A fewdays in a month	36	15.5
		Never	4	1.7
5	Internet usageduration	1–4 Year	121	52.2
		5–9 Year	87	37.5
		10–13 Year	18	7.8
		14 yearandmore	2	0.9
6	Internet Skill	Inexperienced	36	15.5
		Medium	124	53.4
		Advanced	60	25.9
		Proficiency	12	5.2
7	Internet Access Place	PersonalComputer	28	12.1
		Home	73	31.5
		School	15	6.5
		Internet Cafe	27	11.6
		Friend's Home	3	1.3
		Morethanone	17	7.3
		All	69	29.7
8	Adoption of cyberloafingbehavior	Yes	47	20.3
		No	141	60.8
		No idea	43	18.5
9	Department	CIT	50	21.6
		RCMKT	38	16.4
		SST	45	19.4
		CT	22	9.5
		TT	17	9.3

		MT	29	12.5
		ST	30	12.9

Participants consisted of a total of 232 students including 130 male and 102 female. The vast majority of the participants were first-year students. When grade point averages were analyzed, it was observed that the majority were between the grade range of 2.50-3.50. 37.5% of participants use the internet every day, 45.3% of them use it for several days a week and 15.5% of them use it for a few days in a month. 1.7% of them do not use the internet. When internet usage seniority was analyzed, it was seen that 52.2% of the participants were between 1-4 years, 37.5% of them were between 5–9 years, 7.8% of them were between 10-13 years and 0.9% of them were between 14 years and over. The vast majority of the participants stated the place of accessing the internet as home(31.50%). According to the results of the Household Information Technologies Usage Research conducted in April 2015 in Turkey, 69.50's% of households have internet access. 16-24 age group is the age group with the highest rates of computer and internet usage. These rates are higher among males in all age groups. The highest rate of computer and internet use by educational status belong to college, faculty and higher graduates. (TSI, 2015). The result obtained in the research is in the same direction with the research of TSI.

Findings regarding the perceived cyberloafing behaviors

Participants were asked whether they find cyberloafing behaviors during the course acceptable. 60.80% of the participants mentioned that this behavior is unacceptable, 18.50% of them did not express an opinion in this regard and 20.30% of them mentioned that this behavior is acceptable. Participants' opinions on cyberloafing behavior according to overall dimensions and scale are presented in Table 4.

Table 4. Perceived cyberloafing behaviors

Dimension	Socialization	News-reading	Personal-related Works	Total
f	231	231	231	231
Mean	2,6129	2,8247	1,5877	2,17
Std. Deviation	,91532	1,13568	,63401	,67624
Min	1.00	1,00	1,00	1,00
Max	5,00	5,00	4,17	4,25

When Table 4 was analyzed, it was concluded that a very small percentage of students adopted the cyberloafing behaviors during courses ($\bar{x}$=2.17). It was observed that the cyberloafing behaviors which were mostly shown by students were news following (X=2.82) and socializing behaviors (X=2.61) respectively, and the cyberloafing behavior which were shown at the least by students was individual works (X=1.58;SS=,634).I visit news sites (X=3.36), I download the file (X=3.06) and I check my e-mails (X=2.90) were the items on which participants mostly expressed opinions. Findings regarding whether there is a significant difference between participants' perceived cyberloafing behaviors in terms of independent variables are presented below.

Findings regarding perceived cyberloafing behaviors in terms of the gender variable;

MWU analysis results regarding participants' perceived cyberloafing behaviors in terms of the gender variable are presented in Table 5.

Table 5.MWU analysis results regarding the perceived cyberloafing behaviors in terms of the gender variable

Dimension	Gender	f	MeanRank	Sum of Ranks	U	Sig
Socialization	Female	102	121,82	12426,00	5985,00	2,38
	Male	129	111,40	14370,00		
	Total	231				
News-reading	Female	102	148,66	15163,50	3247,500	.000
	Male	129	90,17	11632,50		
	Total	231				
Personal-related Works	Female	101	122,39	12361,00	5819	.159
	Male	129	110,11	14204,00		
	Total	230				

The perceived cyberloafing behavior in terms of the gender variable constitutes a significant difference in favor of female participants only in the news following dimension (U=3247,500).

Findings regarding perceived cyberloafing behaviors in terms of the department

Whether there was a significant difference of opinion between the department variable and the perceived cyberloafing behavior wasanalyzed by KWH test. KWH test results of the analysis performed are presented in Table 6.

Table 6.KWH test results for the perceived cyberloafing behavior in terms of the department variable

Dimension	Department		f	MeanRank	χ2	df	sig	Difference U
Socialization	CIT	(1)	50	133,13				1-2
	RMT	(2)	38	79,75				
	SS	(3)	45	125,57				
	CT	(4)	22	117,20				
	TT	(5)	17	135,47				
	MT	(6)	29	132,22				
	ST	(7)	30	91,42				
	Total		231		22,706	6	001	
News-reading	CIT	(1)	50	115,90				
	RMT	(2)	38	87,71				2-3
	SS	(3)	45	124,28				
	CT	(4)	22	118,70				
	TT	(5)	17	125,62				
	MT	(6)	29	142,28				
	ST	(7)	30	106,75				
	Total		231		13,182	6	,040	
Personal-relatedwork	CIT	(1)	50	143,51				
	RMT	(2)	38	69,88				1-2
	SS	(3)	45	118,16				2-3
	CT	(4)	22	123,86				
	TT	(5)	17	135,62				
	MT	(6)	29	112,47				
	ST	(7)	29	107,76	29,993	6	,000	
	Total		230					

As a result of the KWH test performed, a significant difference of opinion emerged between the department variable and the perceived cyberloafing behavior in terms of all dimensions ($\chi2$ = 22,706), ($\chi2$= 13,182) and $\chi2$ = 29,993). It was concluded that there was a significant difference of opinion with Religious culture and moral knowledge teaching in favor of CIT teaching department in the *socialization* dimension (U=500,500), with Religious culture and moral knowledge teaching in favor of social studies teaching in the *news following dimension* (U=579,500) and with Religious culture and moral knowledge teaching in favor of CIT teaching department and social studies teaching in the *individual works dimension* (U=31,500).

Findings regarding perceived cyberloafing behaviors in terms of the students' grade point averages variable

Students' opinions on grade point averages and the perceived cyberloafing behaviors were analyzed by KWH test and its results are presented in Table 7.

Table 7. KWH test results regarding the perceived cyberloafing behaviors in terms of students' grade point averages

Dimension	Grade		f	MeanRank	χ2	df	sig	Difference U
Socialization	1.50–1.99 (1)		8	131,88	10,706	4	,030	1-2-3
	2.00-2.49	(2)	25	79,78				1-4
	2.50-2.99	(3)	85	93,76				
	3.00-3.49	(4)	53	81,82				
	3.50-4.00	(5)	11	117,95				
	Total		182					
News-reading	1.50–1.99 (1)		8	110,50	3,350	4	,501	
	2.00-2.49	(2)	25	91,00				
	2.50-2.99	(3)	85	95,63				
	3.00-3.49	(4)	53	82,03				

	3.50-4.00	(5)	11	92,55				
	Total		182					
	1.50–1.99 (1)		8	131,06	6,989	4	,136	
Personal-relatedwork	2.00-2.49	(2)	25	81,22				
	2.50-2.99	(3)	85	91,01				
	3.00-3.49	(4)	53	87,75				
	3.50-4.00	(5)	11	107,95				
	Total		182					

As a result of KWH test performed, there was a significant difference of opinion between students' grade point averages and the perceived cyberloafing behaviors in the socialization dimension ($\chi 2$ = 10,706) As a result of the MWU tests which were performed between the groups in order to find out from which grade range the difference resulted, it was observed that there was a significant difference of opinion in favor of students with low grade point averages between the opinions of the students in the 1.50-1.99 grade range and those in the 2.00-2.49 grade range (U= 44,500), between those in the 1.50-1.99 grade range and those in the 2.50-2.99 grade range (U= 190,500), and between those in the 1.50-1.99 grade range and those in the 3.00-3.49 grade range (U=107,000). This result indicates that students with low grade point averages show more cyberloafing behaviors in terms of socialization.

Findings regarding perceived cyberloafing behaviors in terms of the grade variable

Whether there was a significant difference of opinion between the grade variable and the perceived cyberloafing behavior was analyzed by KWH test. KWH test results of the analysis performed are presented in Table 8.

Table 8. KWH test results regarding whether there was a difference between the grade variable and the perceived cyberloafing behaviors

Dimension	Class		f	MeanRank	$\chi 2$	df	sig	Difference U
Socialization	1 st	(1)	129	114,27	7,817	3	,050	
	2 nd	(2)	85	109,31				
	3 rd	(3)	2	131,25				
	4 th	(4)	14	162,18				
	Total		230					
News-reading	1 st	(1)	129	111,46	8.241	3	,041	1-4
	2 nd	(2)	85	113,77				2-4
	3 rd	(3)	2	206,50				
	4 th	(4)	14	150,25				
	Total		230					
Personal-relatedwork	1 st	(1)	129	121,37	17,470	3	,001	1-2
	2 nd	(2)	85	97,36				
	3 rd	(3)	2	121,25				
	4 th	(4)	14	170,71				
	Total		230					

As a result of the KWH test performed, it was found that there was significant difference of opinion with the news following ($\chi 2$ = 8,241) and individual works ($\chi 2$ = 17,470) dimensions in terms of the grade variable. Paired comparisons were made in order to determine the differences between the students studying in different grades. As a result of the MWU tests performed, significant differences of opinion emerged in favor of 4th grade students between 1st grade students and 4th grade students (U=528,500) and between 2nd grade students and 4th grade students (U=327,500).In the individual works dimension, a significant difference of opinion emerged in favor of 1st grade students between 1st grade students and 2nd grade students (U=4324,000) .

Findings regarding perceived cyberloafing behaviors in terms of internet usage skills

Whether there was a significant difference of opinion between the internet usage skills and the perceived cyberloafing behavior was analyzed by KWH test. KWH test results of the analysis performed are presented in Table 9.

Table 9. KWH test results regarding whether there was a difference between the internet usage skills and the perceived cyberloafing behaviors

Dimension	Skill		f	MeanRank	χ2	df	sig	Difference U
Socialization	inexperienced	(1)	86	125,72	5,916	3	,116	
	Medium	(2)	104	110,69				
	Advanced	(3)	36	100,47				
	Proficiency	(4)	4	156,00				
	Total		230					
News-reading	inexperienced	(1)	86	118,22	5,106	3	,164	
	Medium	(2)	104	121,05				
	Advanced	(3)	36	92,92				
	Proficiency	(4)	4	116,13				
	Total		230					
Personal-relatedwork	inexperienced	(1)	86	123,74	8,304	3	,040	
	Medium	(2)	104	112,73				2-4
	Advanced	(3)	36	96,71				
	Proficiency	(4)	4	179,50				
	Total		230					

As a result of the KWH test performed, it was found that there was a significant difference of opinion between the internet usage skills and the perceived cyberloafing behaviors in the Individual work dimension (χ2 = 8,304). As a result of the MWU tests which were performed between the groups in order to find out from which student groups with internet usage skills the difference resulted, significant differences of opinion were found in terms of showing cyberloafing behaviors in favor of those with "medium-level" internet usage skills and the groups with internet usage skills as an expert (U=81,000).

Findings regarding perceived cyberloafing behaviors in terms of internet usage seniority

Whether there was a significant difference of opinion between the internet usage seniority and the perceived cyberloafing behavior was analyzed by KWH test. KWH test results of the analysis performed are presented in Table 10.

Table 10. KWH test results regarding whether there was a difference between the internet usage seniority and the perceived cyberloafing behaviors

Dimension	Duration		f	MeanRank	χ2	df	sig	Difference U
Socialization	1-4 years	(1)	119	110,18	7,433	3	,059	
	5-8 years	(2)	87	109,86				
	9-12 years	(3)	18	144,44				
	13+ years	(4)	2	190,75				
	Total		226					
News-reading	1-4 years	(1)	119	109,98	4,156	3	,245	
	5-8 years	(2)	87	111,87				
	9-12 years	(3)	18	141,75				
	13+ years	(4)	2	139,75				
	Total		226					
Personal-relatedwork	1-4 years	(1)	119	109,43	8,460	3	,037	1/3-4
	5-8 years	(2)	87	110,75				
	9-12 years	(3)	18	143,75				
	13+ years	(4)	2	203,25				
	Total		226					

As a result of the KWH test performed, it was found that there was a significant difference of opinion between the internet usage seniority and the perceived cyberloafing behaviors in the Individual work dimension (χ2 = 8,640). As a result of the MWU tests which were performed between the groups in order to find out from which student groups with internet usage seniority the difference resulted, significant differences of opinion were found in terms of showing cyberloafing behaviors in favor of those with more seniority between those with 1-4 years of internet usage seniority and those with 10-13 years of internet usage seniority (U=750,500) and between those with more than 14 years of internet usage seniority (U=19,000).

Findings for the place of accessing internet and the perceived cyberloafing behaviors

Whether there was a significant difference of opinion between the place of accessing internet and the perceived cyberloafing behavior was analyzed by KWH test. KWH test results of the analysis performed are presented in Table 11.

Table 11.KWH test results regarding whether there was a difference between the place of accessing internet and the perceived cyberloafing behaviors

Dimension	Placeuse of İnt.		f	MeanRank	χ2	df	sig	Difference U
News-reading	PC	(1)	28	147,54	10,790	6	,095	
	Home	(2)	72	107,42				
	School	(3)	15	109,97				
	Int.Cafe	(4)	27	95,30				
	Friend'shome	(5)	3	100,17				
	Morethanone	(6)	16	115,06				
	All	(7)	69	120,80				
	Total		230					
	PC	(1)	28	126,04	4,417	6	,620	
	Home	(2)	72	122,87				
	School	(3)	15	100,57				
	Int.Cafe	(4)	27	114,89				
	Friend'shome	(5)	3	69,33				
	Morethanone	(6)	16	112,41				
	All	(7)	69	109,75				
	Total		230					
Personal-relatedwork	PC	(1)	28	155,86	15,221	6	,019	1-2
	Home	(2)	72	109,84				
	School	(3)	15	127,37				
	Int.Cafe	(4)	27	109,52				
	Friend'shome	(5)	3	61,00				
	Morethanone	(6)	16	118,00				
	All	(7)	69	106,58				
	Total		230					

As a result of the KWH test performed, it was found that there was a significant difference of opinion between the place of accessing internet and the perceived cyberloafing behaviors in the *Individual work dimension* (χ2 = 15,221). As a result of the MWU tests which were performed between the groups in order to find out from which student groups the difference resulted, significant differences of opinion were found in favor of the student groups with internet access in their personal computers between Group 1 student groups with internet access in their Personal computers and the students with internet access at home. (U=585,000).

Findings for showing perceived cyberloafing behaviors according to state of agreeing/disagreeing with cyberloafing perspective

Whether there was a significant difference of opinion between the state of agreeing/disagreeing with cyberloafing perspective and the perceived cyberloafing behavior was analyzed by KWH test. KWH test results of the analysis performed are presented in Table 12.

Table 12. KWH test results regarding whether there was a difference between the state of agreeing/disagreeing with cyberloafing perspective and the perceived cyberloafing behaviors

Dimension	Agree/don'tagree		f	MeanRank	χ2	df	sig	Difference U
Socialization	I agree	(1)	46	126,64	1,814	2	,404	
	I don'tagree	(2)	140	111,61				
	I don'thave an idea	(3)	43	113,58				
	Total		229					
News-reading	I agree	(1)	46	122,45	,741	2	,691	
	I don'tagree	(2)	140	113,18				
	I don'thave an idea	(3)	43	112,98				
	Total		229					
Personal-relatedwork	I agree	(1)	46	123,49	,973	2	,615	
	I don'tagree	(2)	140	112,86				

I don'thave an idea(3)	43	112,88
Total	229	

As it is seen in Table 12, as a result of the KWH test performed, it was found that there was not a significant difference of opinion between the state of agreeing/disagreeing with cyberloafing perspective and the perceived cyberloafing behaviors.

CONCLUSIONS AND RECOMMENDATIONS

Cyberloafing can be defined as the out of purpose activities performed in the cyberspace. Cyberloafing may lead to data loss from all units and decreased motivation and attention (Brubaker, 2006). Cyberloafing is an unacceptable behavior in the educational environment as well as in all units. In particular, the presence of internet connection in computer laboratories and the difficulty of following students (King 2007) can cause students to show cyberloafing behaviors. In this study, participants adopted the cyberloafing behaviors in the educational environments (X=2.17) and stated that it was an unacceptable behavior. This situation is compatible with the findings of Kalaycı (2010) and Karaoğlan and others (2015). Karaoğlan and others stated that the cyberloafing situations of university students are at medium-level.However, the result, which was obtained in this study, regarding the fact that news following (X=2.82) was the cyberloafing behavior which was mostly shown by students and that individual works (X=1.58) was the cyberloafing behavior which was shown by students at the least is not compatible with the findings of Kalaycı (2010), Ergün and Altun (2012). Kalaycı (2010) concluded in his research that individual works (X=7.26) was the cyberloafing behavior which was shown at the most, news following (X=4.27) was the cyberloafing behavior which was shown at the least. Urgin, Pearson and Odom (2008) found in their research that students showed cyberloafing behaviors for individual and social affairs. Fırat University is located in the East Anatolia Region. The fact that eastern societies have a community-based thinking philosophy instead of individual-centered thinking can be the cause of obtaining such a result. Ergün and Altun (2012) argue that students' cyberloafing behaviors result from the reasons such as getting bored of the course and curiosity. As it was stated by Garrett and Danziger (2008), the spread of social networks can be effective in showing cyberloafing behaviors. However, this situation may negatively affect the efficiency and effectiveness of the courses. Therefore, as Pablo (2012) stated, teachers can control the students and monitor their studies by using advanced technologies.

The perceived cyberloafing behavior in terms of the gender variable constitutes a significant difference in favor of female participants only in the news following dimension (U=3247,500, p<.05).This situation is noncompatible with the research results of Kalaycı (2010) and Dursun et all (2015) and and Karaoğlan et all (2015), Baturay and Toker (2015).In the studies of Keser, Kavuk and Numanoğlu (2016), it was found that pre-school male teachers showed more cyberloafing behaviors than female teachers. Individual works and news following were the cyberloafing behaviors which were shown at the most. And Blanchard and Henle (2008) stated that male demonstrates serious cyberloafing behaviors more than female.

A significant difference appeared between the department variable and the cyberloafing behaviors; and in general, it was concluded that there was a significant difference of opinion between the CIT and Social Sciences Teaching departments and Religious Culture and Moral Knowledge Teaching department. The fact that those in the theology teaching department show more disciplined behaviors, those in the CIT and Social Sciences Teaching departments further use the internet and show cyberloafing behaviors are expected situations. Similar findings were obtained in the research of Karaoğlan et all (2015). They observed difference in news sub-dimension is between CIT and History. However, a significant difference cannot be observed in search and social sub-dimensions in their study.

There was a significant difference of opinion between students' grade point averages and the perceived cyberloafing behaviors in the socialization dimension ($\chi 2$ = 10,706). The difference is in favor of the students with low grade point averages. It can be concluded from here thatstudents with low grade point averages show more cyberloafing behaviors in terms of socialization.Dursun et al. (2015) achieved the same conclusion in their research.

There is a tendency to show cyberloafing behaviors in favor of 4th grade in terms of the grade variable. 4th grade students are CIT students. These students are much more specialized in using the internet compared to the students in the other departments and grades.However, in the research carried out by Dursun et al. (2015), the grade variable was not found significant in terms of showing cyberloafing behaviors. Similar findings were obtained in the research of Baturay and Toker (2015).

Significant difference of opinions about showing cyberloafing behaviors were found in favor of experts between the group who consider themselves expert in using the internet and the group with medium-level internet usage skills ($\chi 2 = 8{,}304$). This situation is compatible with the research findings of Kalaycı (2010). The same situation appeared in the studies of Baturay and Toker (2015) and Keser, Kavuk, Numanoğlu (2016). Baturay and Toker (2015) found in their study that the students who were advanced and expert level internet users were more involved in cyberloafing than intermediate and novice level participants. Similar results were obtained in terms of the internet usage seniority variable. There are significant differences in opinion between the students with advanced level of (14 years and over) internet usage seniority and those with new internet seniority (1-4 years) in the individual work dimension with those old seniority.Relationship between duration of time on the internet and cyberloafing is important since researchers point out that it is harmful when cyberloafing is done in excess and "frequent long durations of cyberloafing should negatively affect academic performance to (Askew, 2012; Blanchard& Henle, 2008). In terms of the place of accessing internet, there are significant differences in opinion between those who use personal computer and the students who use the computer in different spaces in favor of those who use personal computer in the individual works dimension.The same result was also achieved in the research of Dursun et al. (2015).However, Karaoğlu et all (2015) had not found a significantly difference in sub-dimension of locations to connect to the internet in their studies.Similar findings were obtained in the research of Karaoğlan et all (2015). There is not a significant difference in opinion between the state of agreeing/disagreeing with cyberloafing perspective and the perceived cyberloafing behaviors. This situation can be explained by the fact that there is not any difference in students' opinions on cyberloafing behaviors because of the compulsivity of the social norms and class rules or their respect to norms.

RECOMMENDATIONS

Based on the research findings, recommendations have been made for the practitioners and researchers:

For Practitioners;

1. The rules should be clearly stated in the Computer Laboratory and practices should be monitored.
2. Courses should be made attractive for students and students should be held responsible for the studies.
3. The importance of the course hour should be emphasized, and students' time management skills should be developed

For Researchers;

This research is related to the investigation of Faculty of Education students' cyberloafing behaviors. The cyberloafing behaviors of the students in different faculties and colleges can be investigated, and those results can be compared with the results of this research.

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Obstacles Perceived by Physical Education Teachers to Integrating ICT

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ABSTRACT
Teachers find difficulties and barriers about integrating technology in the physical education classroom. Therefore, the aim of this study is to analyse the perception of PE teachers regarding obstacles to integrating ICT and its relation with their age. The methodology followed was quantitative and descriptive in nature. The participants were 400 secondary education PE teachers. A face-to-face standardised interview was used through "EFYTICS" questionnaire. Results of the study showed that the most frequently perceived obstacles were: loss of time spent on physical activity, lack of resources, investment in time and training, unsuitable use, lack of knowledge, and technical problems. By age, these same obstacles were perceived, but in a different order. Improvement actions should be established so as to better integrate ICT, mainly to deal with those obstacles that are more greatly perceived by teachers, in order to use ICT in an educational way in the classroom and to take advantage of all of the benefits they offer to the subject.

Keywords: ICT, physical education teachers, secondary school, perception, obstacles.

INTRODUCTION
Despite all of the benefits of integrating information and communication technologies (ICT) into education (Karsenti & Lira, 2011), their application to the subject of physical education (PE) continues to pose a great challenge for teachers due to the unique nature of the class: the importance of the motor component, limitations on space, time, training, etc. (Villalba & González, 2016). In spite of this, teachers integrate ICT in their PE classes, for example through the use of computers, e-mail and Internet (Gibbone et al, 2010), pedometers, heart rate monitors, telephones, tablets, reality simulators, exergames (Zhu & Dragon, 2016) and mobile applications related to physical activity and sport (Pyle and Esslinger, 2014). However, some authors have expressed the difficulties and barriers teachers face when integrating technology to PE, as well as some approaches that can be taken to overcome them (Pyle & Esslinger, 2014; Shan Fu, 2013). The use of technology in PE is being accepted at a generally slow pace (Gibbone, Rukavina & Silverman, 2010).

Furthermore, a study done by Karsenti and Lira (2011) found that ICT are rarely used in an educational context in various countries (Bauer and Kenton, 2005; Wallace, 2004), and therefore it becomes necessary to continue researching ICT in PE as a unique context due to its specific characteristics (Gibbone et al., 2010).

Throughout the study, reference will be made to the obstacles perceived by dividing them into aspects related to the teachers and those related to the students.

Obstacles perceived to incorporating ICT related to aspects involving the teacher
According to aspects related to the teachers, lack of time is an important obstacle to truly integrating the use of ICT into the PE programme. It takes time to configure said technology, to learn to use it, and to plan and understand how to integrate it into one's own practice during the teaching-learning process in an appropriate, educational manner (Almekhlafi & Almeqdadi, 2010; Legrain, Grillet, Gernigon & Lafreniere, 2015).

Another significant obstacle is the time it takes to train teachers. Cuckle and Clarke (2002) and Yildirim (2007) found that a lack of ICT education in schools that train teachers was a barrier to the use of ICT in the classroom.

Along these lines, Thomas and Stratton (2006) found that there was a clear need for training in order to develop different and specific teaching styles and thus be able to apply ICT to PE teaching; this was necessary if the teachers were fully committed and wanted to be competent in this area.

Related to training, PE teachers' lack of mastery and experience using ICT in the educational context has also been a significant obstacle (Bisgin, 2014; Ertmer & Otternbreit-Leftwich, 2010; Hutchison & Reinking, 2011; Shan Fu, 2013), given that teachers who cannot develop certain skills in the course by using the technology available may face difficulties when transferring the content through traditional methods. Furthermore, another possible barrier is the teachers' lack of confidence to use more ICT in the classroom (Grainger & Tolhurst, 2005). Additionally, Willis (1993) indicates that other barriers may include teachers' personal comfort levels (Gibbone et al., 2010), given that using ICT may mean more workload in terms of organisational aspects (Petrie & Hunter, 2011), and a lack of motivation (Lane & Lyle, 2011; Liu & Szabo, 2009). Another obstacle highlighted by Shan Fu (2013) is PE teachers' low expectations regarding integrating ICT into the subject for improving students' learning (Al-Bataineh, Anderson, Toledo & Wellinski, 2008), as well as teachers' uncertainty about the possible benefits of using ICT in the classroom (Yildirim, 2007).

Another barrier is the context of the PE classroom, i.e., class size and the classroom itself, which are often factors that inhibit the use of technology in teaching PE and make it problematic for teachers to integrate ICT given the difficulty of managing students (Gibbone et al., 2010; Palak & Walls, 2009; Tezci, 2011).

Additionally, studies cite the lack of collaboration and cooperation between teachers, as well as a lack of support from institutions (Brinkerhof, 2006; Butler & Sellbom, 2002; Goktas, Yildirim & Yildirim, 2009; Papanastasiou & Angeli, 2008).

Obstacles perceived to incorporating ICT related to aspects regarding the effects of ICT on students
In terms of teachers' perceptions regarding the effect of ICT on students, Yildirim (2007) indicates that the students' and school's lack of ICT resources (hardware, software and suitable materials) is another obstacle. Moreover, the research finds that limitations on access to and availability of technology decrease opportunities for developing skills for using said technology in schools (Tearle & Golder, 2008); restricted access to technology and scarce available time also limits teachers in reserving computer rooms (Watson, 2001). This last obstacle is very closely related to the lack of technical and financial support (Liu & Szabo, 2009), as well as a lack of sufficient administrative support for the effective use of ICT (Lim, 2007).

Along these lines, another important obstacle to mention is the lack of technological infrastructure and equipment in the PE course. Administrations are not aware of the possibilities for using technology in PE or financial administrators may not view the gymnasium as the PE classroom (Pyle & Esslinger, 2014).

In relation to the cost of technology, the technology budget for PE is also a cause for concern, given that it is very limited (Thomas & Stratton, 2006). A study done by Kretschmann (2015) indicates that if the school director does not recognise ICT as a resource related to PE, he or she therefore cannot support the integration of technology into PE. Moreover, the principals' influence on the budget and school-wide curricular integration in terms of PE should not be underestimated (Staples, Pugach, & Himes, 2005).

Another important obstacle is the loss of time spent doing physical activity in PE. A majority of teachers recognises the positive aspects of technology in education, but they do not know how to put them into practice in their curriculum without taking hours away from time spent doing physical activity (Pyle & Esslinger, 2014). In this respect, technology should not replace PE teaching, but rather it should improve it (Juniu, 2011).

In this regard, the purpose of this study is to examine teachers' perceptions of the obstacles to integrating ICT into PE in secondary education by the degree to which they perceive them. This analysis will allow for a deeper understanding of the perception of barriers to the use of ICT and how to correct them, with the aim of being able to promote a greater educational use of ICT by PE teachers. Furthermore, this study analyses perceptions by age, given that some authors have found that older teachers are less willing to integrate ICT than younger teachers (Bisgin, 2014; Hammond et al., 2009; Lane & Lyle, 2011; Oblinguer & Oblinguer, 2005). In accordance with this general purpose, research questions are as follows:

1. What are the obstacles faced by PE teachers to integrated ICT in their classrooms?
2. Is the teachers' age an important factor that influences on the obstacles to integrated ICT in PE classrooms?

METHODOLOGY

Participants

The participants in this study were 400 secondary education PE teachers in the Autonomous Community of Madrid (Spain), of whom 254 were men (63.5%) and 146 were women (36.5%), with age groups ranging between 20-29 years old (n=20; 5%), 30-39 years old (n=121; 30.25%), 40-49 years old (n=138, 34.5%), and 50 years and over (n=121; 30.25%). The average age was 44.1 and the standard deviation 9.065.

Instrument

Standardised interviews were carried out using the "EFYTICS" questionnaire, created ah hoc for this purpose and previously validated using the Delphi method (19 university professors holding PhDs who are experts in ICT in PE), an expert panel (10 specialists), and a pilot study (40 PE teachers). To achieve the study's objectives, the item *teachers' perception of the obstacles to incorporating ICT into PE classes* was analysed. A Likert scale of 1-5 was used. The interaction of this item was studied in relation to age and Cronbach's alpha for this item (0.901) was used as a reliability criteria and showed excellent internal consistency.

Procedure and Data Analysis

A random sample of participants was used to perform this descriptive study. The research was approved by the University of Alcalá (Madrid) Ethics Committee. The interviews were carried out by the study's main researcher. Additionally, the participants were informed of the confidential nature of the interviews and their anonymity was assured. Then, the participants completed the questionnaire through a face-to-face oral interview with the interviewer (as is common practice for questionnaires in this type of study in Spain). The interviews were carried out in public and private schools and lasted an average of twenty minutes. All of the data were collected, organised and tabulated with SPSS software for Windows (V 19.0). The descriptive analysis was carried out using Pearson chi-squared and Phi.

RESULTS

The study found that PE teachers perceive all of the obstacles to integrating ICT that were analysed at percentages greater than 27.2% for agree and strongly agree (tables 1 and 2). In terms of the perception of obstacles to incorporating ICT related to aspects involving the teacher (table 1), 61.5% agree or strongly agree that integrating ICT into the teaching process involves an investment in time and in training PE teachers (M=3.6; SD=1.1); 51.5% say they do not know how to integrate ICT into the practice of physical activity (M=3.4; SD=1.1); and 48.2% of teachers perceive technical problems and the delays they could cause as an obstacle to integrating ICT (M=3.3; SD=1.1). However, the least perceived obstacles (between agree and strongly agree) were the resistance of teachers to changing methodologies (38%); the difficulty for teachers to manage students (32.7%); and the lack of teachers' interest in ICT (29.4%).

Table 1: Obstacles perceived to incorporating ICT related to aspects involving the teacher

	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		M	SD
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*		
Lack of knowledge for integrating ICT	28	7	54	13,5	112	28	141	35,3	65	16,2	3,4	1,1
Investment in time and training	25	6,3	43	10,7	86	21,5	157	39,3	89	22,2	3,6	1,1
Difficulty in managing students	37	9,3	79	19,7	153	38,3	103	25,7	28	7	3	1
Lack of interest in ICT	43	10,8	91	22,8	148	37	98	24,4	20	5	2,9	1
Resistance to changing methodologies	39	9,7	84	21	125	31,3	119	29,8	33	8,2	3,1	1,1
Little confidence and technical problems	27	6,8	56	14	124	31	142	35,5	51	12,7	3,3	1,1
Organisational problems and a lack of support and information from the institution	36	9	63	15,7	137	34,3	115	28,7	49	12,3	3,2	1,1

In terms of the obstacles that obtained the highest percentages in relation to aspects regarding the effects of ICT on students (table 2), a high percentage of teachers (64.4%) agree or strongly agree that ICT in PE lead to a decrease in the time students spend doing physical activity in class (M=3.8; SD=1.1); followed by the students' or the school's lack of material and economic resources with 63.2% (M=3.7; SD=1.2); and the students' unsuitable use of ICT with 54.9% (M=3.6; SD=1). The least perceived obstacles (between agree and strongly agree) were that ICT increase the students' isolation (38.2%); the students' superficial learning (28.9%); and loss of students' attention (27.2%).

Table 2: Obstacles perceived to incorporating ICT related to aspects regarding the effects of ICT on students

	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		M	SD
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*		
Lack of material and economic resources	30	7,5	36	9	81	20,3	139	34,8	114	28,4	3,7	1,2
Loss of physical activity time	19	4,8	33	8,3	90	22,5	133	33,2	125	31,2	3,8	1,1
Superficial learning	27	6,8	77	19,3	180	45	85	21,2	31	7,7	3,1	1
Increase in a sedentary lifestyle and obesity	41	10,3	78	19,5	111	27,8	103	25,7	67	16,7	3,2	1,2
Unsuitable use	15	3,8	40	10	125	31,3	146	36,5	74	18,4	3,6	1
Loss of attention	41	10,3	93	23,2	157	39,3	80	20	29	7,2	2,9	1
Abuse of use and dependence	32	8	44	11	113	28,3	132	33	79	19,7	3,5	1,2
Students' isolation	35	8,7	79	19,8	133	33,3	106	26,5	47	11,7	3,1	1,1
Excessive work on theoretical content	23	5,8	74	18,5	107	26,8	131	32,8	65	16,1	3,3	1,1
Excess of virtual reality	26	6,5	71	17,8	137	34,3	106	26,4	60	15	3,3	1,1

By age, with regard to the aforementioned obstacles related to teachers (table 3), significant differences have been found with considerable and moderate relationships in the obstacles most highly perceived by teachers 30 years or older: the investment in time and teacher training (phi=0.696; p=0.036) with percentages between 60.4% and 66.1%; and a lack of knowledge from students and teachers to integrate ICT into the practice of physical activity (phi=0.354; p=0.021), with percentages between 47.2% and 56.2%. However, these two obstacles have been perceived in second place by teachers from 20-29 years old, although with different percentages. The next most perceived obstacle by teachers in the 20-29 age range was organisational problems and a lack of support from the institution where they work (30%). This same obstacle is also the third most perceived by teachers over 50 years old, while the most perceived obstacle for teachers between 30 and 49 years old is a lack of confidence in the media. It should be noted that the obstacles of lack of teachers' interest in ICT, the difficulty for the teacher to manage students, and organisational problems were the least perceived (between agree and strongly agree) for teachers from 30 to 49 years old, with different percentages. A lack of interest was also the second least perceived obstacle by teachers from 20-29 years old and for those over 50 years old. The least perceived obstacle by the youngest teachers is the resistance to changing methodologies (25%).

Table 3: Obstacles perceived to incorporating ICT related to aspects involving the teacher according to age

	Age	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		X^2
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Lack of knowledge for integrating ICT *	20-29 years	2	10	9	45	2	10	4	20	3	15	50.228
	30-39 years	7	5.8	16	13.2	30	24.8	54	44.6	14	11.6	
	40-49 years	10	7.2	16	11.6	38	27.5	47	34.1	27	19.6	
	50 years and more	9	7.4	13	10.7	42	34.7	36	29.8	21	17.4	

Investment in time and training *	20-29 years	2	10	5	25	6	30	4	20	3	15	34.813
	30-39 years	8	6.6	14	11.6	19	15.7	54	44.6	26	21.5	
	40-49 years	6	4.3	13	9.4	33	23.9	54	39.1	32	23.3	
	50 years and more	9	7.4	11	9.1	28	23.1	45	37.2	28	23.2	
Difficulty in managing students	20-29 years	4	20	6	30	3	15	6	30	1	5	27.858
	30-39 years	13	10.7	24	19.8	41	33.9	32	26.4	11	9.2	
	40-49 years	10	7.2	28	20.3	56	40.6	36	26.1	8	5.8	
	50 years and more	10	8.3	21	17.4	53	43.8	29	24	8	6.5	
Lack of interest in ICT	20-29 years	3	15	7	35	7	35	2	10	1	5	33.862
	30-39 years	13	10.7	25	20.7	45	37.2	32	26.4	6	5	
	40-49 years	12	8.7	41	29.7	48	34.8	34	24.6	3	2.2	
	50 years and more	15	12.4	18	14.9	48	39.7	30	24.8	10	8.2	
Resistance to changing methodologies	20-29 years	4	20	5	25	6	30	4	20	1	5	40.110
	30-39 years	11	9.1	23	19	37	30.6	40	33.1	10	8.2	
	40-49 years	8	5.8	35	25.4	39	28.3	47	34.1	9	6.4	
	50 years and more	16	13.2	21	17.4	43	35.5	28	23.1	13	10.8	
Little confidence and technical problems	20-29 years	3	15	5	25	3	15	7	35	2	10	39.777
	30-39 years	9	7.4	13	10.7	35	28.9	50	41.3	14	11.7	
	40-49 years	7	5.1	18	13	42	30.4	48	34.8	23	16.7	
	50 years and more	8	6.6	20	16.5	44	36.4	37	30.6	12	9.9	
Organisational problems and a lack of support and information from the institution	20-29 years	5	25	3	15	6	30	4	20	2	10	37.530
	30-39 years	10	8.3	24	19.8	40	33.1	32	26.4	15	12.4	
	40-49 years	10	7.2	18	13	55	39.9	42	30.4	13	9.5	
	50 years and more	11	9.1	18	14.9	36	29.8	37	30.6	19	15.6	

*p≤0.05; **p≤0.01

In terms of the teachers' perceptions by age regarding aspects related to the effects of the use of ICT on students (table 4), teachers over 30 years old perceive ICT to lead to a decrease in time students spend doing physical activity in class (between 64.4% and 66.1%), followed by the obstacle of a lack of material and economic resources (between 61.1% and 65.3%). This last obstacle is significant (phi=0.371; p=0.007) and the relationship is moderate. In the 20 to 29 years range, teachers perceive the greatest obstacle (between agree and strongly agree) to be the unsuitable use of ICT by students (65%), followed at the same percentage (50%) by the loss of time spent doing physical activity, a lack of resources, and the students' abuse of use. The third most perceived obstacle varies between each age range; the youngest teachers perceive it to be the loss of students' attention at 45%. This obstacle is significant (phi=0.327; p=0.046) and the relationship is moderate. For teachers between 30-39 years old, it is the unsuitable use of ICT by students (61.2%); for those aged 40-49 it is the students' abuse of use (51.5%); and for those over 50 years old, it is the excess of theoretical content (56.2%). The fourth most perceived obstacle by the youngest teachers is the excess of virtual reality in ICT (40%). This obstacle is significant (phi=0.374; p=0.005) and the relationship is moderate.

The least perceived obstacles for teachers over 40 years old (between agree and strongly agree) were the loss of students' attention (between 18.2% and 31.4%) and students' superficial learning (between 26.9% and 33.9%). Between 30 and 49 years, the third least perceived obstacle was the students' isolation, with percentages between 33.9% and 37%.

Table 4: Obstacles perceived to incorporating ICT related to aspects regarding the effects of ICT on students according to age

	Age	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		X^2
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	
Lack of material and economic resources *	20-29 years	3	15	6	30	1	5	6	30	4	20	54.910
	30-39 years	14	11,6	8	6,6	20	16,5	50	41,3	29	24	
	40-49 years	5	3,6	8	5,8	35	25,4	44	31,9	46	33,3	
	50 years and more	8	6,6	14	11,6	25	20,7	39	32,2	35	28,9	
Loss of physical activity time	20-29 years	3	15	4	20	3	15	5	25	5	25	35.202
	30-39 years	3	2,5	13	10,7	25	20,7	41	33,9	39	32,2	
	40-49 years	5	3,6	6	4,3	37	26,8	45	32,6	45	32,7	
	50 years and more	8	6,6	10	8,3	25	20,7	42	34,7	36	29,7	
Superficial learning	20-29 years	3	15	6	30	6	30	4	20	1	5	37.457
	30-39 years	10	8,3	23	19	55	45,5	25	20,7	8	6,5	
	40-49 years	9	6,5	30	21,7	62	44,9	27	19,6	10	7,3	
	50 years and more	5	4,1	18	14,9	57	47,1	29	24	12	9,9	
Increase in a sedentary lifestyle and obesity	20-29 years	3	15	3	15	7	35	4	20	3	15	40.637
	30-39 years	18	14,9	23	19	33	27,3	30	24,8	17	14	
	40-49 years	9	6,5	28	20,3	41	29,7	35	25,4	25	18,1	
	50 years and more	11	9,1	24	19,8	30	24,8	34	28,1	22	18,2	
Unsuitable use	20-29 years	2	10	1	5	4	20	7	35	6	30	30.648
	30-39 years	3	2,5	9	7,4	35	28,9	57	47,2	17	14	
	40-49 years	3	2,2	19	13,8	45	32,6	44	31,9	27	19,5	
	50 years and more	7	5,8	11	9,1	41	33,9	38	31,4	24	19,8	
Loss of attention *	20-29 years	2	10	7	35	2	10,0	6	30	3	15	42.829
	30-39 years	10	8,3	28	23,1	46	38,0	28	23,1	9	7,5	
	40-49 years	14	10,1	34	24,6	65	47,1	17	12,3	8	5,9	
	50 years and more	15	12,4	24	19,8	44	36,4	29	24,0	9	7,4	
Abuse of use and dependence	20-29 years	2	10	5	25	3	15,0	5	25	5	25	30.335
	30-39 years	9	7,4	17	14	31	25,6	41	34	23	19	
	40-49 years	10	7,2	11	8	46	33,3	41	29,7	30	21,8	
	50 years and more	11	9,1	11	9,1	33	27,3	45	37,2	21	17,3	
Aislamiento del alumno	20-29 years	4	20	5	25	7	35	2	10	2	10	39.436
	30-39 years	9	7,4	31	25,6	40	33,1	31	25,6	10	8,3	
	40-49 years	9	6,5	28	20,3	50	36,2	36	26,1	15	10,9	
	50 years and more	13	10,7	15	12,4	36	29,8	37	30,6	20	16,5	
Excessive work on theoretical content	20-29 years	1	5	8	40	8	40	3	15,0	0	0	38.390
	30-39 years	8	6,6	23	19	30	24,8	47	38,8	13	10,8	
	40-49 years	8	5,8	24	17,4	41	29,7	39	28,3	26	18,8	
	50 years and more	6	5	19	15,7	28	23,1	42	34,7	26	21,5	
Excess of virtual reality *	20-29 years	2	10	5	25	5	25	7	35	1	5	56.033
	30-39 years	9	7,4	26	21,5	44	36,4	29	24	13	10,7	
	40-49 years	7	5,1	32	23,2	46	33,3	29	21	24	17,4	
	50 years and more	8	6,6	8	6,6	42	34,7	41	33,9	22	18,2	

*p≤0.05; **p≤0.01

DISCUSSION

This study found that the most perceived obstacles by PE teachers in terms of their perceptions of how integrating ICT would affect aspects involving the teacher (between agree and strongly agree) were the investment in time and PE teacher training, a lack of knowledge for integrating ICT in the practice of physical activity, and technical problems and the delays they may cause. With regard to age, the most perceived obstacles coincide in all age ranges, although with different percentages and orders of perception.

Various studies also find the time investment to be a large obstacle to the use of ICT in PE (Almekhlafi & Almeqdadi 2010; Grainger & Tolhurst, 2005; Legrain et al., 2015), mainly in terms of learning, practice, planning, and trying to integrate ICT into teaching curricula. Additionally, training is also considered by other studies to be a barrier for ICT integration (Cuckle & Clarke, 2003; Grainger & Tolhurst, 2005).

In relation to the lack of knowledge to integrate ICT into PE practice, Thomas and Stratton (2006) argue that although an individual may have a high skill level with ICT for their personal use, transferring this knowledge to the classroom is complicated. Bisgin (2014) cites the lack of PE teachers' mastery of ICT as a significant barrier to introducing them into their teaching process. Kretschmann (2015) and Yaman (2008) argue that insufficient knowledge and experience with ICT in PE influence the application and promotion of ICT use in the subject.

In terms of delays caused by technology, Grainger & Tolhurst (2005) reference teachers' lack of confidence when they use ICT in the classroom. Almekhlafi and Almeqdadi (2010) and Yildirim (2007) indicate that this lack of confidence may be caused by a fear of failure due to technical problems (Hixon & So, 2009), as well as accidents and failures that may arise during the classes.

The least perceived obstacles (between agree and strongly agree) were: a resistance to changing methodologies, the difficulty for teachers to manage students, and the lack of teachers' interest in ICT. These results are supported by several authors such as Petrie and Hunter (2011), who found that ICT are seen as an external pressure for teachers in curricular and organisational changes and they create additional work. Moreover, other authors mention other obstacles, such as the number of students in the class, as this makes it more difficult for the teacher to manage students (Tezci, 2011); the teachers' personal comfort (Gibbone et al., 2010); and their lack of motivation (Lane & Lyle, 2011; Liu & Szabo, 2009).

These obstacles have been the least perceived in all age ranges at different percentages, although between 20 and 49 years old, teachers also underlined organisational problems and a lack of information and support from the school. In this regard, some authors (Brinkerhof, 2006; Ertmer & Otternbreit-Leftwich, 2010; Hutchison & Reinking, 2011; Lane & Lyle, 2011) highlight the lack of collaboration and cooperation between teachers, as well as a lack of pedagogical and technological support.

In this study we can see that in terms of the obstacles to integrating ICT related to aspects involving the teachers, teachers between 30-39 years old and 40-49 years perceive the majority of obstacles in higher percentages. This coincides with the study done by Lane and Lyle (2011), which concludes that in several cases the middle-aged group perceives the barriers to a greater extent than the younger teachers and the oldest teachers.

In terms of the obstacles to integrating ICT related to aspects of how their use affects students, the most perceived are the students' loss of physical activity time in class, a lack of students' or the school's material and economic resources, and the unsuitable use of ICT by students. Regarding the loss of physical activity time, Pyle and Esslinger (2014) indicate that technology and PE are often seen as being on opposite extremes between a sedentary lifestyle and the movement that the class requires. Similarly, the study done by Kretschmann (2015) finds that PE teachers at first do not think that ICT and their class are connected given that the main objective of the class is motor in nature.

In terms of the lack of resources, the scarcity of infrastructure and technological equipment is one of the obstacles that the PE class faces according to Pyle and Esslinger (2014). The budget and therefore the cost of this equipment is also a cause for concern where the budgets for PE are restricted (Thomas & Stratton, 2006).

With regard to the unsuitable use of ICT by students, Moisescu (2014) and Ugarte and Ros (2015) indicate that we must not ignore the abuse of technology and the dependence or addition that students may develop to technology if used incorrectly.

Depending on age, these obstacles were also the most highly perceived by teachers with different percentages and different orders of perception. Older teachers (over 50 years old) have the highest percentages in the majority of the obstacles considered.

The least perceived obstacles (between agree and strongly agree) were that ICT increase the students' isolation, the students' superficial learning, and loss of students' attention in class. In terms of the first of these, Moisescu (2014) indicates that specialists have shown that spending a lot of time in front of the computer affects concentration levels, aggression levels, isolation, etc.

By age, the least perceived obstacles were the same, but with different percentages and order of perception, and additionally included an excess of theoretical content among teachers aged 20-29 and an increase in sedentary lifestyle among older teachers (over 50 years old). With regard to the latter, Hall (2012) states that interactive technology can be a solution for solving the problem of inactivity and a sedentary lifestyle.

CONCLUSIONS

Because of the class' particular characteristics, the integration of technology into PE needs alternatives for improving its application in the educational context. For this reason, we must analyse the obstacles teachers face in order to investigate possible strategies that could help to decrease these barriers. This would allow for an educational use of ICT in the class and for an enjoyment of all the benefits and potentials that they offer in the teaching and learning process (Karsenti & Lira, 2011).

This study found that the obstacles most frequently perceived by teachers, regardless of age, were: loss of time spent doing physical activity, lack of resources, investment in time and training, unsuitable use of ICT, lack of knowledge of how to integrate them, and technical problems.

Given these results, we must prioritise strategies to reduce these barriers, such as: provide activities and workshops on how to make educational use of ICT in the PE classroom without reducing physical activity time; offer adequate technical support in schools; increase curricula with improved technological materials; provide teachers with the freedom to choose their curricular material; and promote positive attitudes towards the importance of integrating ICT into teaching (Goktas et al., 2009; Lim, 2007; Shan Fu, 2013; Tezci, 2011).

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Pre-service Teachers' Perception of Quick Response (QR) Code integration in Classroom Activities

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ABSTRACT
Quick Response (QR) codes have been discussed in the literature as adding value to teaching and learning. Despite their potential in education, more research is needed to inform practice and advance knowledge in this field. This paper investigated the integration of the QR code in classroom activities and the perceptions of the integration by pre-service teachers. Forty-four pre-service teachers enrolled on an undergraduate degree at a higher education institution in the United Arab Emirates took part in the study. Data were collected from a questionnaire, student journals and focus group interviews to enable triangulation. The main results suggested that the pre-service teachers perceived the use of QR codes to be easy and useful in learning activities. They also demonstrated positive attitudes towards the QR codes and stated the intention to use this application in their future career. The study provided practical examples of how QR codes can be integrated in teaching. It also revealed certain challenges that could hinder effective integration of QR code applications in the classroom. Recommendations for practice and future research are discussed.

Keywords: Quick Response (QR) code, classroom activities, integration

INTRODUCTION

The Quick Response (QR) code system has recently been introduced in Education (Rivers, 2009). It is a form of machine readable matrix barcode that has been around for almost two decades. It is an application that allows scan patterned 2D squares to obtain fast access to information (Jupiter, 2011; Shin, Jung, & Chang, 2012). QR codes can potentially add value to learning activities by encouraging students to create and share learning content (Sampson, 2012; Yusof, Goolamally, Latif, & Fadzil, 2012), engage students with different learning needs (Chen et al., 2010), and facilitate learning inside and outside the classroom (Crompton, LaFrance, & van't Hoof, 2012; Pérez-Sanagustín,, Parra, Verdugo, García-Galleguillos & Nussbaum, 2016).

Despite their potential benefits, the adoption of QR codes in educational settings is still in its infancy (Albastroiu & Felea, 2015) and consequently, there is a clear need for more research examining the integration of QR codes in higher education (Gradel & Edson, 2012). This observation urges researchers to conduct further studies to investigate how QR codes can be integrated in leaning activities and inform practice (Abdol Latif, Fadzil, Munira, & San, 2012). In this regard, based on an undergraduate course taught at a higher education institution in the United Arab Emirates (UAE), this paper has two aims; first to discuss the integration of QR codes in classroom activities, and second, investigate participants' perceptions of the integration. The following research questions were sought:

1. What are pre-service teachers' perceptions of QR codes in learning activities regarding the ease of use, usefulness and attitudes?
2. What are pre-service teachers' intentions of using QR codes in their future teaching?
3. What are the factors that affect pre-service teachers' attitudes towards the integration of QR codes in learning activities and their intention to use it in future teaching?

The authors expect to provide a practical example of the implementation of QR codes in the classroom and add to the body of knowledge on how this system can support learning activities.

BACKGROUND LITERATURE

The advantages of QR codes include fast readability and capacity, and a link to any type of information that can be accessed from any location using enabled-wireless mobile devices. The QR code reader application, which when installed on mobile devices, allows users to read the data in the code and present the information in the form of video, link, text or other formats. Researchers like Robertson and Green (2012) discussed examples of how QR codes could be used in the classroom, for example, they noted that students could generate their own codes and attach to pictures they had previously found online. In addition, the authors provided a list of aspects to consider before implementing QR codes in teaching such as Internet connectivity and their value for the users. Similarly, Gradel and Edson (2012) and Thorne (2016) described several QR code activities that instructors could implement in higher education.

Chaisatien and Akahori (2007) discussed a system that combined both mobile phones and QR codes as a supporting learning tool. The system was used in an undergraduate course during poster sessions. The authors conducted a pilot study to gauge students' feedback about the system. Survey results suggested that the majority of students did not like the QR codes in poster sessions because they had to get closer to them to read the codes. Students also found it hard to visualize the whole content in one page because of the relative small size of the phone screen. However, students felt positive towards the application stating that it was easy to use, and it would be useful to use in larger classes. Additionally, Lee, Lee and Kwon (2011) described a teaching approach named "scan and learn" that integrated QR codes and smartphones during a biology class field trip. The use of QR codes motivated students to learn about natural fauna in a better way than using the traditional printed materials, and allowed them to discuss the results using one of the social network sites. A further example of how QR codes can be used in teaching is provided by Power (2013). Students could access just-in-time information as they explored course content in small groups at their own pace.

Huang, Wu and Chin (2012) discussed a procedural scaffolding approach (thinking before talking) using paper-based materials and electronic materials via QR codes supported by smartphones. Huang et al. adopted a mixed methods experimental study to investigate whether procedural scaffolding enriched collaborative learning and learning outcomes. Results suggested that the procedural scaffolding strategies not only helped enhance group learning outcomes but also individual learning outcomes. In future implementations, the authors suggested that bigger screen sized devices such an iPad could help students type and read more effectively. Susono and Shimomura (2006) further illustrated the use of QR codes in education as an assessment tool. Results from the survey indicated that 43% students found it useful to use QR codes as a formative assessment aid as it allowed them to easily evaluate their progress. However, more than half (57%) had concerns regarding costs of using their phones and Internet, and they did not feel comfortable using their devices in face-to-face classes.

In contrast to Susono and Shimomura (2006), Lai, Chang, Li, Fan, and Wu (2013) reported the implementation of an integrated QR code system to conduct outside learning activities. About 160 elementary teachers participated in a 2-hour workshop to learn how to use the system and later completed a questionnaire based on the Technology Acceptance Model (TAM). The results suggested that both the ease of use and the usefulness of the system had a significant positive correlation with teachers' intention to adopt the system in the future. Pérez-Sanagustín et al. (2016) presented another approach to use QR codes outside the classroom. The authors adopted an experimental design to explore the delivery of content for an exhibition in a university campus using two types of QR codes (on-way and two-way type of information). All students, lectures and professionals, who were on the campus, had a chance to participate in the experiment. Results showed that the two-way QR codes had a positive effect on participants' engagement with the exhibits compared to the one-way codes. This study illustrated how QR codes could be used to deliver engaging content.

Study by Rivers (2009) explored Japanese students' attitude towards QR codes and language learning. The authors found some challenges related to the implementation of this application. Some students could not scan the codes, and while others did not understand the function of the codes. On the positive side, the survey suggested strong students' attitude toward the use of mobile phones and QR codes in the classroom. Other studies reported similar positive results (Abdol Latif et al., 2012; Albastroiu, & Felea, 2015; Gogova & Koceska, 2014). Abdol Latif et al., (2012), in addition to studying students' attitudes towards QR in teaching, also performed a multiple regression analysis to assess students' intention to use this application in the future. They found that usefulness and satisfaction had a significant impact on students' intention to continue using QR codes. A drawback reported in the study related to some students not owning a smartphone and costs of Internet connection.

Further study by Durak, Ozkeskin and Ataizi (2016) investigated college students' perceptions of the impact of QR codes in supporting learning. In this study, QR codes, which connected students to web links, applications

and social networks, were added to a lesson unit. Fifteen pre-service teachers participated in individual interviews. Results suggested students' positive attitude toward QR codes in supporting their learning, and they would use this application in the future. Similar to Abdol Latif et al., (2012), Durak et al. (2016) found some challenges attached to the implementation of QR codes such as Internet speed and lack of technical skills to install and use the application. In the same vein, Yip, Melling and Shaw (2016) studied the use of QR codes to provide undergraduate students with instantaneous access to a database. Survey results suggested the codes were seen by students an effective and easy strategy to access online instructional materials. The majority would recommend its use to access the database.

The above studies are useful not only to inform practice on the uses of QR codes in teaching but also to make a contribution towards knowledge as more research is needed in this field of inquiry. Many of the studies, however, relied on surveys while some provided only descriptions of how QR could be used in education. Similar to Durak et al. (2016) and Huang et al. (2012), our study will focus on the implementation of QR codes to support classroom activities and study participants' perceptions of such implementation.

CONTEXT AND PARTICIPANTS

We conducted the study at a higher education institution in the United Arab Emirates, in the academic year 2013-2014. A 15-week course offered in Year 4, consisting of three sections, was selected for the study. This course was chosen as we had convenient access to the students. Another reason for choosing this course related to allowing students experiment with a new teaching strategy (Quick Response codes) before their graduation. All 44 female pre-service teachers enrolled in the three sections agreed to participate. In case a student did not give their consent to participate, they still would be able to access the QR codes activities. About 97.7% of the students were in the 20 -25 age group, and one student was within the 26 –30 years old.

IMPLEMENTATION

We introduced the QR codes to the students in week 1. Wireless access was provided to students who needed it. Two weekly QR code activities were planned for two months. The activities included extra support to help students to complete tasks in the classroom. Support included hints, links to websites, videos, pictures, and illustrations. For example, Figure 1 shows a scenario that required answers to a series of questions (left hand side). For each question, a code was added to the worksheet to support students. On a different task, Figure 1 provided different kinds of support using a variety of formats (right hand side).

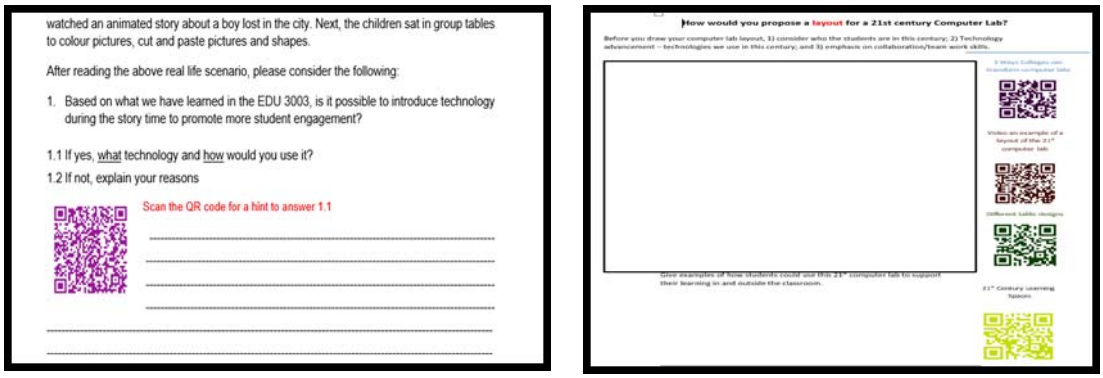

Figure 1. The QR codes using a variety of formats

DATA COLLECTION

We adopted an anonymous questionnaire, student journals and focus group interviews as data collection.

1. *Questionnaire:* it included closed questions, multiple choices, ticking boxes, yes and no type of questions, and a Likert scale (from strongly agree/5 to strongly disagree/1). We developed the questionnaire based on the Quick Response (QR) codes literature (Gogova & Koceska, 2014; Lee et al., 2011; Shin et al., 2012. The Likert scale statements were adapted from and Rikala and Kankaanranta's (2012) study; however, a few statements were based on the work by Gogova and Koceska (2014), Shin et al. (2012), Rivers (2009) and Lee et al. (2002). The questionnaire was piloted with 60 freshmen students. The test showed high reliability (r= 0.79). A total of 44 students completed the questionnaire.
2. *Journal*: the journal had four guiding questions: 1) what do you like most about the integration of QR in classroom activities? 2) what do you like least about the integration? 3) what recommendations do you have? and 4) what are your general experiences of scanning and using QR codes? Students were asked to record their notes every time they were exposed to a QR classroom activity. A total of 41 students completed the journals.

3. *Focus group*: three focus group interviews were conducted with a sample of students from the three sections. Each focus group consisted of five students (n=15). The focus group interview covered prior experience with QR codes, its use in and outside the classroom, ease of use, usefulness and recommendations. The interview questions were piloted by the same faculty who piloted the questionnaire for content validity. The interviews were audio taped and lasted approximately 35 minutes.

DATA ANALYSIS

Descriptive statistics were calculated to answer the research questions 1 and 2. Simple linear regression analysis was calculated to answer question 3 by predicting the factors (the independent variable-ease of use, usefulness and attitude) that affect the dependent variable (students' intention of using QR codes) relationships between the research variables (ease of use, usefulness, attitude and intention of use). The simple linear regression analysis was also calculated to predict the factors (the independent variables – ease of use and usefulness) that would affect the independent variable (students' attitude).

Qualitative data consisting of journals and focus group interviews were analyzed using Nvivo software. We analyzed the data without a prior list of codes. One of the authors read across the interviews and created a preliminary list of codes. This list went through changes where some codes were merged or deleted. Data were later assigned to each code. Next, we looked for themes inside and across categories. We discussed the codes and coding to validate the interpretations. Similar procedures were followed to analyze the answers from the journals.

RESULTS

In this section, quantitative data are presented first followed by the qualitative results.

Quantitative Data

Smartphone ownership amongst students was almost 100% (only one student did not own a Smartphone). About 65.9 % used the Internet connection provided by the institution to scan the codes. The majority (98%) scanned the QR codes in class. In addition, 54.5% accessed the QR code activities outside the classroom. One student, in particular, did not scan the codes because her phone did not support a code reader application.

Results in Table 1 clearly show positive perceptions of the ease of using QR codes in classroom activities. Although there is overall agreement, a few students may have faced issues with the speed for scanning the codes.

Table 1. Ease of use

Statement (scale 5– 1)	Mean (n= 44)	SD
The QR codes made access to website links easy	4.00	0.86
I found it easy to scan the QR codes	4.48	0.63
It was easy to learn how to scan QR codes using my mobile device	4.25	0.92
The speed of scanning a QR code was sufficient*	3.80	0.86
QR codes were simple and convenient to use	4.16	0.78

*Source: Shin et al. (2012)

Table 2 suggests agreement regarding the usefulness of the QR codes. Although there is a tendency to agreement on the first statement, the above results showed that some students did not use the QR outside the class; this may explain the value shown in Table 2 (M: 3.81).

Table 2. Usefulness

Statement (scale 5- 1)	Mean (n= 44)	SD
I found it useful to access the QR codes outside the classroom to complete the activities	3.81	0.93
The information provided in the QR codes helped me complete the activities	3.96	0.74
QR codes provided access to a variety of useful information*	4.14	0.73
The QR codes were useful in solving the problems in the worksheets	4.18	0.72

*Source: Lee et al. (2011)

Table 3 indicates a clear tendency to positive attitudes towards the use of QR codes to support classroom activities. Table 4 presents an overall tendency to agreement regarding students' intention to use QR in the future.

Table 3. Student attitude towards QR codes

Statement (scale 5- 1)	Mean (n= 44)	SD
It is a good idea to use QR code to support learning activities	4.23	0.86
QR activities are a very interesting way to learn*	4.07	0.87
I enjoyed interacting with the QR activities	3.97	0.82
I have positive feelings toward using QR codes in the classroom	4.16	0.83

*Source: Gogova & Koceska (2014)

Table 4. Intention of use

Statement (scale 5- 1)	Mean (n= 44)	SD
I would like to do QR activities again	3.98	0.85
I intent to use QR codes in the future	3.84	0.86
I will encourage other teachers to use QR codes to support in-class activities	3.89	1.05
I would like the QR codes activities to be part of the curriculum I teach*	3.86	1.08

*Source: Rivers (2009)

As seen in Tables 5, students' attitude was the only factor that affected students' intention of using QR codes (independent variable). A significant regression equation was found F (3, 40) = 21.041, p < .000 with an R2 of .612.

Tables 6 shows that usefulness was the only factor that affected students' attitude towards QR codes. A significant regression equation was found F (3, 40) = 46.083, p < .002 with an R2 of .776.

Table 5. Linear regression analysis results - Intention is the dependent Variable

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	SD	B	t	Sig.
(Constant)	.425	.547		.777	.442
Attitude Usefulness	1.105	.173	.934	6.378	*.000
Ease of Use	-.020	.176	-.017	-.115	.909
	-.267	.183	-.225	-1.460	.152

**Significant at .01 level*

Table 6. Linear regression analysis results - Attitude is the dependent variable

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	SD	B	t	Sig.
(Constant)	.194	.353		.550	.585
Ease of Use Usefulness	.173	.110	.168	1.571	.124
Intention	.361	.106	.359	3.393	*.002
	.456	.072	.540	6.378	*.000

**Significant at .01 level*

Qualitative Data

Results from the journal show that 29 students liked the opportunity to save information on their mobile devices and the easy and fast access to information. In addition, QR codes were fun (n=9), interesting (n=8), engaging (n=6), attractive (n=4), enjoyable (n=5) and a new way for learning. Despite the positives, 27 students did not like the fact that the QR codes activities needed Internet. More specifically, they said the Internet connection was a problem or could not access it. Three found the institution Internet connection slow. Other aspects students did not like included the small size of the phone screen, the complexity of the vocabulary in the activities, and flat battery. In terms of future improvements, four main themes emerged from journal:

1. integrate similar QR code activities in other subjects (n=34)
2. improve Internet connection (n=39)
3. offer training to students on how create and integrate QR codes (n=20)
4. make mobile devices available in the classroom to be used when needed (n=5)

The section below presents the analysis of the focus group interviews, organized in four main themes.

1. *Prior experience*: three students had prior experience with scanning QR codes such as scanning a magazine and a newspaper. Five had seen the QR codes before but did not know what they were for. All 15 students did not know that QR codes could be used "for learning." In addition, all said having used the QR codes activities inside and outside the classroom.
2. *Ease of use and intention:* All students indicated it was easy to scan and use the reading application. However, one felt that, although it was easy to scan, sometimes one needs to scan the code more than one time to get the information. In addition, 12 students said they would use the QR codes in the future for educational purposes. They also planned to use the codes in their internship during the following semester.
3. *Usefulness:* thirteen students indicated they learned from the integration of QR codes in the classroom activities. It provided them with a way of scaffolding, for example, by giving them hints for solving a problem or answering a question. Most of the students found the hints useful and a fun strategy. The 13 students also found useful linking the worksheets to videos, websites, and podcasts because it helped them understand what is required to finish the activities. One student, however, did not find the QR codes useful because she could not read from her mobile device.
4. *Recommendations:* twelve students recommended the integration of QR codes in other subjects. Five students also recommended using QR codes to make the daily lesson learning outcomes and tasks available to the students. One student suggested that students could scan the QR codes and complete assignments on their mobile devices instead of using a paper-based format.

DISCUSSION

Results show, overall, positive perceptions regarding the integration of QR codes in the classroom. Concurrent with other findings (e.g. Abdol Latif et al., 2012; Lai et al., 2013; Yip et al., 2016), students perceived QR codes as an easy to use and useful application to support learning activities. Although we planned the QR codes for in-class activities, more than half of the students also scanned the codes outside the class, and found it useful (m=3.81). This was confirmed in the focus group interviews. This finding suggests that, in order to maximize its educational benefits, QR codes activities should be planned for both inside and outside the classroom as exemplified by Lee et al. (2011) and Pérez-Sanagustín et al. (2016).

Results also suggest, overall, that the pre-service teachers not only demonstrated positive attitudes towards the integration of QR codes in learning activities but also had clear intentions to use the system in the future. Data from the journal about what students liked most about this application further supported their positive attitudes. Their recommendations in the journal and focus group interviews to include this application in other subjects also indicate their positive attitudes towards the QR codes. Similar findings were reported by others (e.g. Abdol Latif et al., 2012; Chaisatien, & Akahori, 2007; Durak et al., 2016). In addition, the regressions analysis revealed attitude towards the use of QR codes as the single factor that significantly impacted on students' intention to use this application in the future. This may suggest that the planned activities facilitated a positive learning experience that impacted on students' attitudes. However, more research is needed to verify this statement.

A closer look at the qualitative data indicates a few difficulties that may hinder the effective integration of QR codes in teaching, and, in turn, impact on student attitudes. For example, a significant number of students mentioned problems with Internet speed, and made recommendations for improvement. Rivers (2009), for instance, noted that there are several issues that need to be resolved for effective implementation of QR codes. Rivers found that those students who were against QR codes in class, pointed out that not all mobile phones could scan the codes. In our study, despite the few identified limitations, they did not impact on how students perceived the QR codes; perhaps due to its novelty. The implication is that instructors need to carefully consider

student mobile devices' capacity to scan the codes, and whether there is a reliable wireless connection for effective integration. These issues may disadvantage a student as she or he will not be able to benefit from the information available in the codes. Others (Durak et al., 2016; Susono & Shimomura, 2006; Lee et al., 2011) also found some challenges related to QR codes implementation in teaching.

The study indicates that usefulness was the single factor that significantly impacted on students' attitudes towards QR codes integration in class. This may suggest that the pre-service teachers understood its value in classroom activities. In week 1, we explained the reasons for using this application and although it requires more research, this factor may have helped students understand why we were introducing QR codes in the activities. As noted by Albastroiu, & Felea (2015), "the key to successful adoption of QR code in education is to understand why students might use this technology...design and adopt codes that are more precisely targeted and tailored to student' preferences, and more useful in the learning process" (p. 201). In contrast to our study, Rivers (2009) found that some students did not understand the QR codes activities.

Recommendations for Practice

This study provides the following recommendations to effectively implement QR codes in teaching:

1) Develop QR code activities for both inside and outside the classroom to make learning more meaningful.
2) Have students creating their own QR codes.
3) Conduct a needs assessment of student mobile devices' capacity and ownership to avoid inequity.
4) Concurrent with Robertson and Green's (2012) list of considerations, provide reliable Internet connection as QR code activities depend on Internet access.
5) Explain to students the educational value of QR codes in activities.
6) Have instructors attending workshops or seminar to learn how to effectively integrate this application in teaching.
7) Encourage instructors to experiment with QR codes in teaching, and share their experience with colleagues.

Limitations and Future Research

Despite the positive outcomes, this study must acknowledge some limitations. The sample consisted of female students and the study was based on educational technology courses. Researchers could consider a more heterogeneous group and a different context to validate the findings. They could also investigate the implementation of other QR activities, both inside and outside the classroom, and consider different subjects to strengthen the results of this study. A further topic to investigate is whether the design of the instructional activities impacts on student attitudes and intentions to use QR codes in the future. It could be interesting to research both student and instructor perspectives of the integration of this application in teaching.

CONCLUSIONS

This paper described the integration of QR codes in class activities, and pre-service teachers' perceptions of the integration by students enrolled upon an undergraduate course within the UAE. Results suggested that the pre-service teachers perceived QR codes as an easy and useful application to support learning activities. They also demonstrated an overall positive attitude and intention to use this application in the future. Their attitude toward the integration of QR codes was affected by only one factor which was usefulness. Additionally, the study discussed some challenges that could hinder the effective integration of QR code systems in teaching and learning. These issues need be resolved in order to maximize the educational benefits of QR codes. Recommendations for practice and future research were discussed.

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Reading from Multimedia Materials: Benefits of Non-congruent Pictures on Reading Comprehension for Dyslexic Readers

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ABSTRACT
Pictures are often integrated in digital learning materials with the purpose of enhancing learning. This mixed methods study uses quantitative eye-tracking data and qualitative data such as oral answers to discover whether characteristics of pictures influence patterns of text–picture transition in readers with (n=10) and without (n=14) dyslexia, and how reading comprehension is affected. Most participants attended to the picture with a "non-congruent with reality" motif early in the inspection process. Qualitative analysis of oral answers showed that retaining the gist of that specific picture led to more developed answers, even for the dyslexic group. Early attention to the picture thus gives readers a fair chance of starting with a holistic impression of the material to be processed.

Keywords
Multimedia, dyslexia, eye-tracking, reading comprehension, mixed methods

INTRODUCTION
Pictures are often used in digital learning materials with the purpose of enhancing learning, unfortunately without accounting for readers' different cognitive abilities (Scheiter, Wiebe, & Holsanova, 2008). For example, Authors (Submitted) found in an eye-tracking study that participants with dyslexia inspected pictures later than those without dyslexia. This general tendency, however, was drawn from an analysis that did not distinguish between different pictures. Analyzed separately, would different pictures result in different transition patterns for the two groups? Our aim of this paper is to investigate how and whether inspection patterns of three different pictures affect reading comprehension for dyslexic and non-dyslexic participants. To achieve this aim we have made use of a mixed methods design, integrating quantitative eye-tracking data such as fixations and dwell times with a qualitative analysis of other visual (quantitative) data such as scan paths, but also oral answers from the participants in a convergent parallel design (Klassen, Creswell, Clark, Smith, & Meissner, 2012). As the use of eye-tracking measurements is related to the eye-mind hypothesis of Just and Carpenter (1980), which states that where individuals place their gaze they also place their attention, we argue that merely quantitative data cannot account for the complexity of processes running when readers encounter materials consisting of both text and pictures. Frequently, research in this field employs a design that involves first analyzing the quantitative eye-tracking data to establish visual patterns, then adding scores from reading comprehension questions to explain the learning effect. Still, this leaves the question of why participants choose to inspect the material in a specific way unresolved. The focus in our study is to integrate quantitative and qualitative data, collected at the same time, to better understand how two groups of participants handle material where pictures are integrated into texts and their reading comprehension evolves. Figure 1 illustrates how each data set contributes to the research question (shortened here).

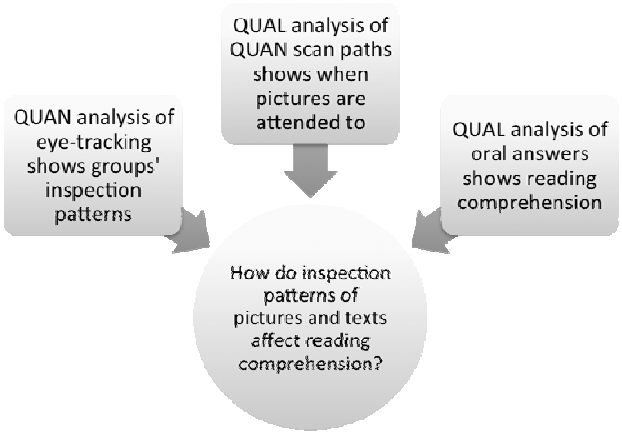

Figure 1. How the data sets are related to the research question

Before we elaborate more on our study, we would like to return to the issue of pictures in texts and what is known from earlier research in the field, although it is important to bear in mind that this research has not focused on dyslexic readers. Previous studies have found that when presented with learning materials in an uncontrolled order, most people tend to start with reading and then look at the picture (Hegarty & Just, 1993; Rayner, Rotello, Stewart, Keir, & Duffy, 2001; Schmidt-Weigand, Kohnert, & Glowalla, 2010). For example, in a well-known study by Hegarty and Just (1993), participants studied diagrams of pulleys and read texts about them. Results showed a strong tendency to read first and then to inspect the schematic picture. Rayner, Rotello et al. (2001) showed in another study that most people read the text in an advertisement before inspecting the picture connected to it, even if some did make an initial inspection of the picture (Rayner et al., 2001). Schmidt-Weigand, Kohnert and Glowalla (2010) let students read about lightning in different experimental conditions; those who were presented with both text and picture started to read the text before inspecting the pictures. That study also showed that when participants had no time restriction in the experiment, they spent a longer time reading the text, but visual inspection of the illustrations did not increase (Schmidt-Weigand et al., 2010). The shorter time dedicated to inspecting pictures in all studies could be explained by a cultural impulse to ascribe written words more importance than pictures (Jewitt, 2015). Some studies have explicitly investigated how pictures influence reading comprehension for either readers with dyslexia or readers characterized as weak readers. One example is a study by Beacham and Alty (2006) with only dyslexic participants, inspecting learning material consisting of text and picture or only text. The best learning outcomes were found for the group who were given only text (Beacham & Alty, 2006). In contrast to this, Houts, Doak, Doak, & Loscalzo (2006) found positive learning effects of pictures being presented with text for individuals with low literacy. A later study by Saß and Schütte (2015) showed that pictures and texts must contain referential connections to be of use for weak readers. Obviously, more research regarding how readers with dyslexia handle multimedia is needed.

In an experiment with controlled conditions (non-dyslexic participants), positive learning effects were obtained by digitally showing a schematic picture some milliseconds before a text about the same phenomenon is read aloud (Eitel, Scheiter, Schüler, Nyström, & Holmqvist, 2012). Eitel et al. (2012) exposed participants to a schematic picture of a pulley system (for 600 ms, 2 s or self-paced) prior to their hearing a text about the pulley's function. The 600 ms inspection provided spatial information on a global level; in the self-paced condition it was also possible to perceive more detailed information on a local level, which some participants did. The results of this experiment suggest that learners start with a holistic understanding of a picture and are later able to allocate meaning to various parts of the picture. This is in accordance with the reasoning in variation theory about how learning takes place (Marton & Booth, 1997). Marton and Booth write that "learning proceeds, as a rule, from an undifferentiated and poorly integrated understanding of the whole to an increased differentiation and integration of the whole and its parts" (1997: viii). But without knowledge, however fragmentary, of the whole that a learner is dealing with, its parts will not be meaningful. A fragmentary knowledge of the whole may be comparable to the *gist* of a picture, perceived within a few milliseconds.

The gist – a holistic start to processing visual material

The gist of a picture is a very rudimentary impression that can be formulated as a word or a short phrase such as "it's a garden" or "street" (Underwood, 2005). A person can perceive a scene on a global level and have a first brief impression that will later help on a local level to identify details or objects congruent with that setting. Underwood (2005) claims, after going through studies exploring the significance of the gist, that acquiring the gist is "a case of holistic processing facilitating local processing" (p.169). From that perspective, the gist is crucial when viewing pictures, especially when they are integrated with texts. Underwood and Foulsham (2006)

found that if a picture included an object in an obviously wrong place (e.g. a vacuum cleaner on a lawn), that object attracted fixations at an early stage of processing the picture; the gist of the picture was violated when the objects in it were not congruent with the setting. It is as a result of this line of reasoning that we have used the term "non-congruent" in this article when characterizing the surrealistic picture (see Figure 5) and distinguishing it in particular from the other two pictures. The surrealistic picture shows objects not congruent with the setting. Getting the gist of a picture has also been shown to support making correct judgments about sentences shown after the exposure (Calvo, Nummenmaa, & Hyönä, 2008), thus the gist can contribute to reading comprehension. This could be especially important for readers with dyslexia, who still have to use basic cognitive resources such as decoding, and who tend not to further inspect pictures as early as those without dyslexia.

Dyslexia and reading

Dyslexia is commonly explained as a syndrome with weak phonological coding as an underlying factor (Guardiola, 2001; Laasonen, Lipsanen, & Virsu, 2012; Paulesu et al., 2001; Snowling, 2000). As a syndrome, dyslexia can manifest in various ways in different individuals (Laasonen et al., 2012). In spite of the heterogeneity, phonological processing deficits (Peterson & Pennington, 2015) constitute a common feature, which is critical in the process of fluent reading (Everatt & Reid, 2009). The deficits in phonological ability result in problems mapping sounds to signs and vice versa, which in turn aggravate word decoding and slow down reading fluency (Engen & Høien, 2002). Reading is more demanding for dyslexic readers and research shows disparate findings with regard to whether pictures embedded in texts are helpful or not for the reading comprehension of dyslexic readers.

THE CURRENT STUDY

The overarching question explored in this paper is how *pictures* affect reading comprehension; consequently the visual data is placed in focus, treated both quantitatively and qualitatively. Bazeley and Kemp (2012) stated that "just having different sources of data does not imply mixing of methods" (p. 69). Despite that, it seems to be common, according to Greene (2008), that studies only mix data sets in the discussion section when inferences about the results are made, instead of the more challenging approach of mixing data types in the analysis. Mixing in the analysis could, for example, consist of transforming data from quantitative to qualitative or comparing one set of data with another data set during the analysis process, thus letting one data type inform another (Greene, 2008). The earlier in the paper the integration takes place the better (Bazeley & Kemp, 2012). A promising integration was found in a small-scale case study by Levesque and Corrigan (2014), who analyzed eye-tracking data and think-aloud protocols from three participants' inspections of online photographs in the domain of history. In the discussion section, they consistently integrated results from the two databases, drawing inferences such as, for example, showing that younger, more media-familiar students both benefit and do not benefit from online visual material. Without the mixed methods approach the conclusions would have leaned in one direction, failing to detect the divergence in the results. Against this backdrop we would like to assert that integrating eye-tracking movements with qualitative data sets is a successful way to achieve the complex answers that complex questions call for.

Research must considerate the effect of dyslexia on the ability to process multimodal material, as otherwise designs may be disadvantageous for students with dyslexia, and educational access may be classified as a "wicked problem" (Mertens, 2015). In addition, multimedia research has paid little attention to images other than schematic pictures or diagrams (Scheiter, Wiebe, & Holsanova, 2008). Using replications of paintings from different artistic traditions, as in our study, may enrich earlier results in the field of multimedia. It would be valuable in the design of learning materials to know whether certain kinds of pictures are more likely to attract early inspection, create a holistic impression, and thus impact on reading comprehension. Further, with a mixed methods approach, more complex answers can be obtained, shedding light on how dyslexic readers process text and pictures that are integrated.

A general assumption about the benefit of using pictures together with texts is that when the same theme is presented in two formats it is possible for the reader to make connections between the text and the picture and use those connections to reach a deeper level of comprehension. This presumes existing congruency between pieces of information, which is not always the case. Ariasi and Mason (2011) reported from an eye-tracking study that learners fixated longer on information that conflicted with their earlier conceptions, which is in line with the results Underwood and Foulsham (2006) presented about perceiving the gist of a non-congruent picture. Thus, our first hypothesis was about whether different motifs in the pictures mattered for time of inspection and dwell time on the picture. Our second hypothesis was related to promising learning effects from displaying a picture before textual information, obtained for example by Eitel et al. (2012). On the basis of this, we expected that learners would show a deeper level of comprehension if they inspected the pictures before reading, and thus had a holistic impression of the information to be processed (Hypothesis 2). Finally, with regard to the third

hypothesis, we wanted to establish at which points in the text participants chose to transition to the picture. We expected certain signal words to trigger the inspection of the picture as readers attempted to make connections between the text and the picture (Hypothesis 3).

As a background to this study, we provide here a short description of the original experiment (Authors, submitted), from which new data was drawn for this re-analysis. The original experiment had 46 participants. All were screened for phonological ability with the DUVAN instrument (Lundberg & Wolff, 2003; Wolff & Lundberg, 2003) to ensure that participants could be divided into two groups, dyslexic and control. The experiment had two conditions: text only or text and picture, thus following a 2x2 design. Stimuli in the text only condition contained verbal information about six genres of art (abstract art, impressionism, cubism, romanticism, surrealism and pop-art) and in the text and picture condition an illustration was used as visual information in addition to the verbal. The texts in both conditions provided information about how motifs were composed, frequent motifs in that specific art genre, and the techniques and intentions of the artists in each genre. The pictures visualized information about motifs, composition, and techniques. The texts (an example i translated into English in the appendix) were presented on the left half of the screen and had a mean of 81words.

Stimuli were shown on a computer screen, and participants used the mouse to click through six screens with information and questions six times. The six screens comprised of:

1. Written name of an art genre.
2. Information in either text only or text and picture about the named genre
3. An empty screen - research leader asked: “What information about [the art genre] did you get from the last screen?”
4. Multiple-choice text question about the current genre with one correct answer.
5. Ranking on Likert-scale how confident they were about the answer
6. A pictorial question where participants choose among three paintings the one that was an example of named genre.

The experiment ended with one question about how familiar the participant was on beforehand with the information in the experiment, rating from not at all to very familiar on a four point Likert-scale.

METHODS

Guetterman, Fetters and Creswell (2015) list three types of basic design in mixed methods studies: exploratory sequential, explanatory sequential and convergent designs. This study used convergent parallel mixed method, as both qualitative and quantitative data were collected at the same time. Both data sets were then analyzed in different ways, qualitatively and quantitatively, to answer the hypotheses.

As a starting point, to find out if groups differed in inspection patterns, we compared eye-tracking data consisting of registered events, expressed as numbers. Specifically, we compared the means of number of fixations, dwell times on different areas of the stimuli, and average fixation time between groups and between types of pictures. The affordances built into the eye-tracking technology enabled us to consider the quantitative registrations of eye-movements as “footprints” of someone else’s inspection patterns. We seized this opportunity to look with another individual’s gaze; the recorded eye-movements over the stimuli created a scan path, similar to a movie. To find where in the text participants shifted from text to picture, we played the scan paths at 10% of normal speed twice and mapped transition points from text to picture. During this process we were forced to experience other people’s choices about where to look at a specific time. We have categorized this data set as quantitative and qualitative, due to the fact that we here use quantitative data that we interpret as expressions of consciousness. This particular method emerged during the process (Klassen et al., 2012) and was not planned beforehand. By the use of this method we could investigate whether a certain word or passage in the text resulted in transitions between text and picture (see Figure 7). The three texts were divided into 10 units, each representing 10% of the whole text. For example, the text about surrealism consisted of 90 words in Swedish, and the first unit was the first nine words of the text and so on. The units were used to measure and compare how far into each text participants read before they inspected the picture.

We analyzed the oral answers with a qualitative approach to measure levels of reading comprehension. Answers were transcribed from the web-cam recordings, coded with a number, and read as a whole several times. The readings were aimed first at finding out how the answers related to the original text, and then whether participants used words directly connected to the text or paraphrased to create an independent explanation. Finally, we established whether the oral answers were merely repetitions of the texts or interpretations of what participants had read. Thus, both utterances and eye-movements were interpreted and integrated in order to investigate how patterns of transition between text and pictures differ or are similar between young adults with

or without dyslexia. See Figure 2 for a description of which types of analysis we used to investigate the hypothesis and in which order the different data sets were employed.

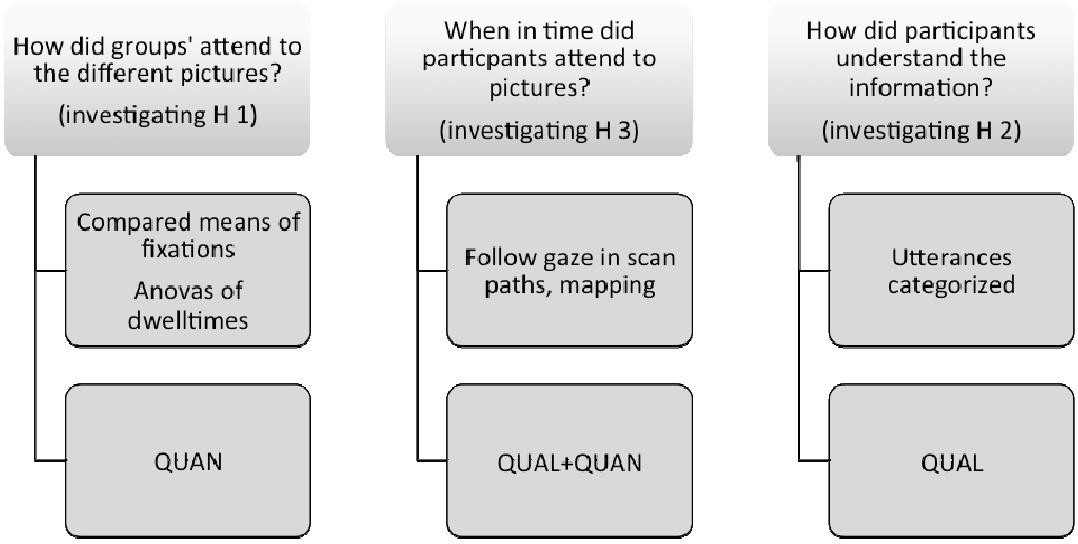

Figure 2. Types of data sets (in chronological order).

Participants

Participants' (n=24) mean age was 23.2 years. Ten participants were previously diagnosed by professionals and had been found to have developmental dyslexia. The remaining 14 participants were assigned as a control group. The maximum score on the phonological test DUVAN was 294 points; the mean for the control group was 214 points (SD=29 points) and for the group with dyslexia 123 points (SD=15 points). Participants also rated their pre-knowledge about art on a five-point scale. The group with dyslexia had a mean of 2.5 (SD=1.3) and the control group had a mean of 2.6 (SD=1.4) for self-rated pre-knowledge.

Materials

The text and the pictures representing three genres of art that were analyzed in this paper were chosen on the basis of variation in picture features, such as saliency or composition, between cubism, romanticism and surrealism. The cubist painting (see Figure 3) was more or less in one color, brown, although different shades and nuances of brown were used to create a motif. The picture was more a pattern than a depiction. It was clearly an abstract picture.

Figure 3 Picture stimulus for cubism

As a contrast, the painting from the romantic period (see Figure 4) had a clear and more realistic motif: a man standing on a cliff looking out over a vast waterfall, his back turned towards the viewer. The colors were more distinct than in the cubist painting.

Figure 4 Picture stimulus for romanticism

Finally, the surrealistic painting (see Figure 5) differed in a third way: there were many objects to be seen and the colors were quite clear, but there was a lack of congruity between the objects and even within the objects themselves. The figure in the center might first be seen as an elephant, but a second look might reveal that it is no ordinary elephant. The picture shows real objects but in a distorted way, typical of a non-congruent picture as described by Underwood and Foulsham (2006). The non-congruency is related to violations of expected reality.

Figure 5 Picture stimulus for surrealism

Apparatus

Eye-tracking data was collected via a SMI RED250 eye-tracker to record eye movements at a rate of 250 Hz via iView X software (v. 2.7.13). Stimuli were shown on a 22-inch Dell monitor with a resolution of 1680 × 1050 and presented using Experimentation Center (v. 3.0. 155) software.

Retention test

During the experiment, one open-ended question was asked about the previously viewed material. Participants could then express freely what they had read and seen, thus showing their comprehension of the learning material. Participants' answers were recorded with a web-cam. In this paper individual answers about the three pictures (cubism, romanticism and surrealism) are analyzed with respect to whether they were merely repeating the given information or whether they paraphrased it. A total of 72 answers have been categorized into either repeating or paraphrasing (3 genres × 24 participants = 72 answers).

ANALYSIS AND RESULTS

Eye-tracking measures

To investigate whether different motifs mattered for inspection (Hypothesis 1), fixations from the two groups were first counted together. Pictures attracted different numbers of fixations, from 5.5 on the painting in the romantic style, to 6.1 on the cubist painting and about twice that (12.4) on the surrealist painting (see Table 1 for all measures). The dyslexic group's average fixation length was higher on the surrealistic picture, approaching the average length of the control group's fixations.

Table 1 Means and standard deviations of number of fixations and average length of fixations on each of the three pictures for the group with dyslexia and the control group.

Condition		Cubism		Romanticism		Surrealism	
		Number of fixations	Average fixation length (ms)	Number of fixations	Average fixation length (ms)	Number of fixations	Average fixation length (ms)
Group with dyslexia	Mean	6.3	119.7	4.6	119.8	9.7	213.6
n=10	SD	8.3	110.4	6.0	132.5	9.1	94.4
Control group	Mean	6.0	220.1	6.2	262.4	14.3	230.7
n=14	SD	4.3	88.0	3.8	54.1	9.9	77.3
Total	Mean	6.1	178.3	5.5	203.0	12.4	223.6
	SD	6.1	108.2	4.8	117.0	9.6	83.2

Because it has been proposed that the length of fixations is related to cognitive processing (Holmqvist et al., 2011; Just & Carpenter, 1980), dwell times on the three pictures were of interest, and whether they differed between the two groups was also of interest. In order to assess the effect picture type had on dwell time for each group (Hypothesis 1), a multivariate analysis of variance, with dwell times on pictures as the dependent variable and condition (text or text and picture) as the independent variable, was performed. Results showed a main effect of between-subject factor (F (1,22) = 5.134, p < .03). The multivariate analysis also showed a within-subject factor (F (2,22) = 13.50, p < .001). To find out which picture caused this, a follow-up one-way ANOVA was performed, with dwell times on pictures as the dependent variable and condition as the independent variable. It showed a significant effect for the surrealistic picture (F (1,22) = 5.686, p = .026). Neither of the other two pictures had significant values for dwell times (cubist picture p=.24 and romantic picture p=.065). As shown in the graph in Figure 6, the surrealistic picture was inspected for longer than the other pictures in both groups, but substantially longer in the control group.

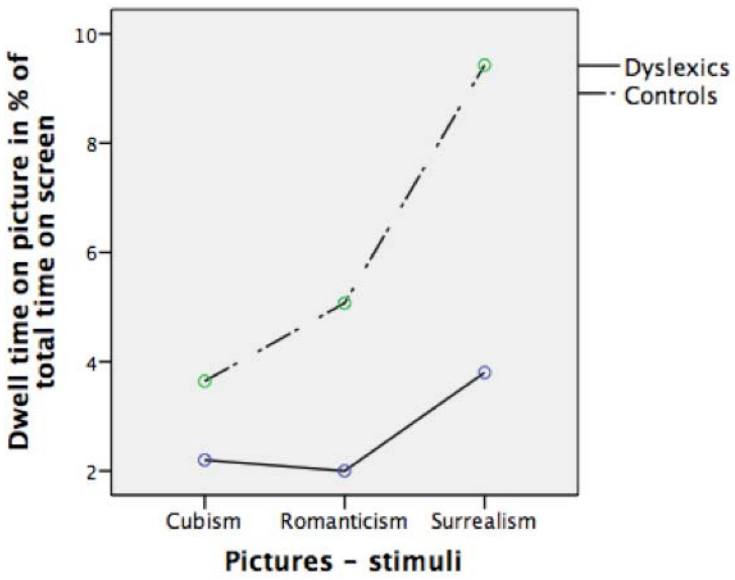

Figure 6 Plotted mean dwell times on pictures in percentage

The fixation mapping revealed individualized ways of handling pictorial information, especially in the group with dyslexia. Four individuals from that group did not fixate at all on either the cubist or the romantic picture; however, three of the four inspected the surrealistic picture. The control group's responses were more even: each one fixated at least once and the standard deviations were lower.

Interplay of text and picture

Hypothesis 3 proposed that certain content-rich words might prompt participants to inspect the picture, but no such effect was found. At most only 4 participants out of 24 chose the same particular word as a transition point. This accords with the individualized processing of pictorial information as described earlier. However, the mapping of transitions between text and picture showed a difference in when inspection of the three pictures occurred. The diagram below (Figure 7) shows that most participants started looking at the screen about surrealism by inspecting the picture, while the picture of cubism had more fixations after participants had read the entire text.

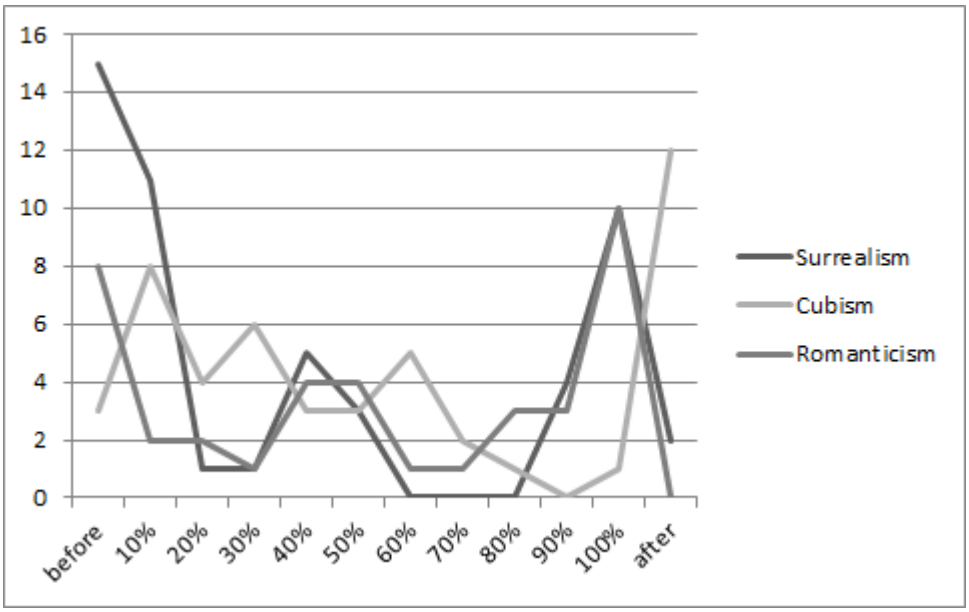

Figure 7 Diagram of transition points from text to picture

Time spent on the text was longer for the dyslexic group, which not was surprising, as reading is more problematic. Figure 8 shows the mean dwell time in milliseconds on texts for each group.

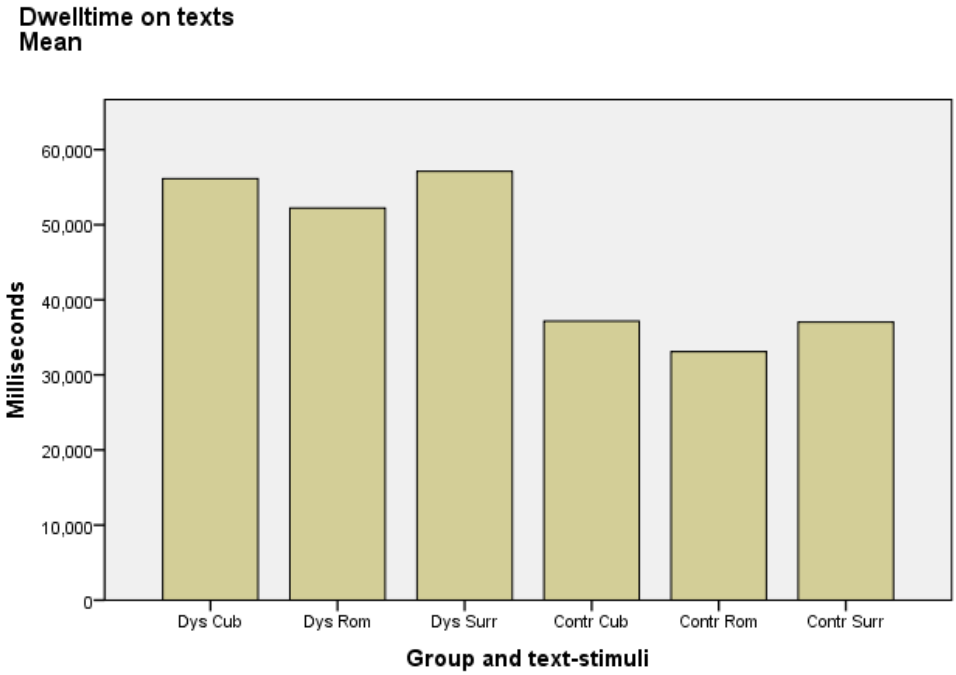

Figure 8 Mean of dwell time in ms on text for each group

The first fixation on the screen for everyone in both groups was in the center, between the text and the picture. A flaw in the study design is the composition of the screen, which makes it impossible to avoid processing the picture in the peripheral visual field while reading the text. Therefore, participants knew after this first fixation *on the screen* that there was a picture to the right, but they probably also knew from their peripheral view that something was "wrong" with the surrealistic picture. Or, as explained by Underwood and Foulsham (2006), the composition of the picture violated the gist. The duration of the first fixation on pictures, which occurred after the initial fixation on the screen, had, for both groups counted together, a mean of 175 ms. The control group's mean first fixation duration on the surrealistic picture was 205 ms, while for the dyslexic group it was 140 ms. This was the lowest mean fixation duration for the control group, but the highest for the dyslexic group.

Dwell times and number of fixations showed that participants looked more often and longer at the non-congruent surrealist picture and less at the non-figurative cubist picture (see Table 1), even if that was also "different" from reality. Mapping the transitions, as shown above, indicated that the surrealist picture attracted early attention, while the cubist painting attracted attention more towards and at the end of the inspection time on that screen. From these findings, what can be said about the quality of the oral answers given for these two genres of art?

Reading comprehension effects in relation to inspection patterns
Participants expressed freely what information they had received from a screen that they had recently studied. In the analysis, the oral answers were not judged as either right or wrong. Furthermore, the utterances are treated as qualitative data. The aim with the analysis of the oral answers was to find out if the reading comprehension level seemed consistent over the three pictures or if it differed, and if it was in any way related to the inspection patterns of the pictures. One way to find out about the reading comprehension level was to look for independent reflections, where participants showed signs of having integrated what they read with previous knowledge, one mark of a deeper reading comprehension (Kintsch & Rawson, 2007). Participants who inspected the picture before reading the text were expected to boost their comprehension of the text (Hypothesis 2). The twenty-four participants gave answers on three art genres, producing a total of 72 answers. Each answer was, as mentioned above, categorized into one of the two categories repetitive or paraphrasing. The first and the second author independently ranked the oral answers into one of the two categories. Repetitive means here that the information from the previous screen was merely repeated, sometimes even verbatim. No new information or interpretation or inferences could be traced in this category. In the other category, paraphrasing, participants might give new information, present new examples, or use information from previous texts, pictures or pre-knowledge. Cronbach's alpha for the 72 judged answers from the two raters was .82, an acceptable value of reliability.

Disagreements were resolved by further discussions between the authors.
The oral answers about cubism and surrealism, which differed most in dwell times and thus will be focused on further, showed that cubism was mainly described by merely repeating phrases from the text, sometimes even verbatim; the answers for surrealism were more likely to paraphrase, interpret, and add relevant assumptions to the information on the screen.

Two examples from four different participants will illustrate 1/ how they each repeated what they had read on cubism, using almost the same words as the text, and 2/ in describing surrealism they interpreted what they had read and expressed ideas that went beyond the actual text.
Example 1:

Participant 1 with dyslexia, cubism: It started in the 20th century; the artists were inspired by African art; they painted humans in parts, and it was very colorless in the beginning and then colors returned.
Participant 2 with dyslexia, cubism: It was an art form during the 20th century, where you took humans and landscapes and made it into geometrical parts.
Participant 1 without dyslexia, cubism: It was the first abstract art, started in the 20th century; they depicted nature using geometrical shapes; they were inspired by African art; in the beginning it was colorless, but later it got more colorful.

Participant 2 without dyslexia, cubism: This was late 1800s or early 1900s; it was inspired by African art, and it was about dividing paintings into geometrical figures, in the beginning the colors were monochrome, but that changed later on.

All four participants mention when cubism began; three mention the source of its inspiration; and all four mentions both the separation of images into parts and the use of colors. The information in each case is given in the same order as it is given in the text.

Example 2:
Participant 1 with dyslexia, surrealism: It started in France around 1920, and instead of having a realistic perspective they, the artist, let go of all his thoughts and used imagination, they could take things and, to give an example, a hot dog that is green.
Participant 2 with dyslexia, surrealism: I found out that surrealism came from France around 1920; it was an art form where you twist reality, so to speak, and really distort it so you get all kinds of strange things, like that something that is as small as an ant can be as big as an elephant while the elephant is the size of the ant; it is about perspectives.

Participant 1 without dyslexia, surrealism: It arose in France around 1920 and it is about passing the barriers of logic and continuing down, down to the unconscious; according to the text the artists somehow flipped things in their heads, and in one way it is about disregarding all the logical rules about how proportions of things are supposed to be; for example, a comb and something else, one erases the boundaries and things become surrealistic; they went behind reality, so to speak.
Participant 2 without dyslexia, surrealism: It arose in France around 1920; it should be a little more dreamlike; it should not be based upon the everyday logic we are used to. For example, they took an egg, an egg could be the size of the sun or a green hot dog could be the same as a comb, it was as if the things floated together with distorted things, this made it hard to sort out what you saw.
In these latter answers about surrealism all four participants mention the place and date of the origin of the genre, but their descriptions of the main ideas in surrealism are individual and they also chose different examples from the text to exemplify their reasoning. A compilation of the answers for cubism, romanticism and surrealism is shown in Table 2.

Table 2 Type of oral answers on cubism, romanticism and surrealism

	Cubism		Romanticism		Surrealism	
	Rep	Para	Rep	Para	Rep	Para
Dyslexic group	10	0	10	0	7	3
Control group	11	3	11	3	6	8

The answers for surrealism are more interpretative; participants paraphrase what they have read about surrealism more than they do for cubism.

DISCUSSION

With a traditional quantitative study, a plausible interpretation of the eye-tracking data might have led to the conclusion that non-dyslexic participants engaged more with the pictures. This is true, in one way, but as we have shown in the results section, there was more to understand around how the material was processed. For example, *both* groups paid more attention to the surrealistic picture, and both groups inspected it early on in the processing of that particular screen, which seemed to positively affect the reading comprehension. Moreover, the "following the gaze" analysis was crucial for understanding the qualitative differences between the oral answers. Thus, we could express the analysis as 1+1=3 (Fetters & Freshwater, 2015) that is, that the outcome of a mixed methods study is more than the sum of than its parts. In this paper the ambition was to reach a deeper understanding of how the material used in the study was experienced. The conclusions drawn from this integration of results and analysis would have been impossible to draw on the basis of one method. This is indeed a huge advantage of mixed methods research (Li, Marquart, & Zercher, 2000) and a challenge for eye-tracking research not to settle for merely quantitative data sets.

Main findings

The main aim of this paper was to find out whether different types of pictures gave the same transition pattern between text and picture, or whether the type of picture influenced the inspection. If the picture influenced inspection, were there any differences between the two groups? If a specific picture elicited more early inspection, could it be said to affect reading comprehension of that screen? Many participants inspected the surrealist picture before they actually began reading the text and this picture also attracted more fixations in total. This verifies Hypothesis 1, that the pictures themselves can matter for time-to-inspection and dwell times. A between-subjects main effect was found, showing that participants from the control group spent more time on the pictures than the dyslexic group.

Reading ability thus seems to matter both to the number of fixations on each picture and to the associated dwell times. In the oral answers for surrealism, where the picture was inspected most often before reading, more participants expressed individualized interpretations of the learning material. Instead of merely repeating what they had read, they made inferences and used previous knowledge, as demonstrated by the fact that they inserted

information not found in the texts. This partially supports Hypothesis 2, that learners would show a deeper comprehension when pictures were inspected before reading material such as that used in this study, in which text and picture treat the same content. Finally, no words were found to have a trigger effect on transitions between text and picture. Thus Hypothesis 3 was rejected.

Non-congruent motif attracts attention

Clearly, the surrealistic picture was inspected the most often and the earliest. This means that readers were more likely to use the information from that picture to enrich the text. The control group had a greater number of fixations and longer dwell times on that picture, as well as longer fixations on the other pictures, than the group with dyslexia. Even so, the group with dyslexia benefited particularly from the surrealistic picture, as they too tended to inspect it *before* reading instead of at the end of the reading session.

Why then is the surrealistic picture the most inspected? We claim, that it is the characteristic of the picture that is crucial, not the art genre. The transition patterns of the participants indicated that by perceiving the gist of the screen, participants discerned the non-congruence of the surrealistic picture. This seemed to provoke an impulse to inspect the image further *before* reading the text. We know from earlier research (Underwood & Foulsham, 2007) that pictures with non-congruent objects attract the attention and give rise to longer fixations. The results of this study are in line with these findings. Thus, it can be assumed that participants decide from the gist they obtain from the screen whether or not to study the picture initially or at length. In this case the assumption is that the non-congruent surrealist picture attracted attention because it differed from participants' pre-knowledge of what pictures normally look like. In variation theory (Marton & Booth, 1997; Marton & Pang, 2006), which is the framework for learning used for the design of the original experiment, (Authors, submitted), differences and contrasts are essential. It is when something differs from the background that individuals discern it. It is noticed as a contrast to a well-known background, thus the individual may discern what something is and become aware of it by distinguishing it from a background of what it is not (Ling & Marton, 2011). Without having discerned and been aware of a phenomenon or an aspect of a phenomenon, individuals cannot process it.

Early inspection facilitates holistic processing of texts

The early inspection of the surrealist picture may have had a positive impact on reading comprehension, as answers about this genre were more independent of the stimulus text. Regardless of whether the participants' intention in inspecting the picture was to better understand the text, it seemed to have that effect. Because participants spent more time processing this picture, they were also able to make connections between what they saw and what they read. Pictures therefore do seem to have an impact on reading comprehension, while inspecting the screen on a global level, which is getting the gist, was not enough to improve comprehension. Something must trigger a more detailed inspection on the local level, thereby creating the possibility of constructing a situation model (Kintsch & Rawson, 2007). It seems only the non-congruent picture of surrealism provided that trigger: the majority of the participants inspected it, and neither of the other pictures, before reading the text.

Furthermore, it seems that because reading is more of a cognitive effort for participants with dyslexia, they had a stronger urge than controls to start processing the text, and therefore disregarded illustrations more than the control group. They spent less time on pictures than the control group, whose total dwell times on pictures were significantly higher. The viewing behavior of the group with dyslexia fitted more closely with earlier results about the text-driven processing of multimedia materials (Hegarty & Just, 1993; Rayner et al., 2001; Schmidt-Weigand et al., 2010). Perhaps this is a wise strategy employed to save mental resources in order to be able to process written text, which is regarded as a higher order cognitive process than that for pictures (Rapp, Broek, McMaster, Kendeou, & Espin, 2007). On the other hand, when the surrealist picture was inspected before reading, the comprehension expressed in several oral answers approached that of a situation model (Kintsch & Rawson, 2007). Further, the inspection of the surrealist picture was especially beneficial for readers with dyslexia, since none of them produced an interpretive answer from the other two art genres (see Table 2). This is particularly interesting since the control group actually inspected the surrealistic picture more than the group with dyslexia, which highlights the importance of *when* a picture is fixated upon. It is thus not only the number of fixations or the dwell time that matters; it is also whether inspection occurs before reading. For the group with dyslexia this early inspection made a difference and it seems that it was a factor that contributed to the qualitative improvement of oral answers.

CONCLUSIONS

As we did not restrict our research to either a quantitative or a qualitative approach, we became able to find more complex answers to the research questions. We found from the fixation mappings that the participants perceived the gist of each screen during the initial centrally placed fixation. We can therefore conclude that a person does

not need to fixate on a picture in order to process it globally; the picture may very well be processed through peripheral vision during apprehension of the gist of a text–picture integrated medium such as the screens in the experiment. Fixations on areas of interest are thus not the *only* measure of how people process information. Getting the gist is an important first step in understanding a text, but not enough. Further comprehension seems to benefit from an early local inspection of the pictorial element. The progression from a global to a local level of inspection allows the possibility of constructing a situation model of the reading material. A major challenge for teachers and others involved in education is to improve the design of learning materials to ensure that readers are prompted to start inspecting pictures and illustrations on a local level, rather than settling for only the gist.

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Appendix

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Surrealism emerged in France around 1920. It has been explained by the word dream-pictures. In a surrealistic painting style artists were supposed to let go of logical thinking and let unconscious and unrealistic combinations of things meld. By pushing reason aside the artist released barriers that made an egg look smaller than the sun or that a table has an even surface. Instead a connection between for example a green hot dog and a gigantic comb were necessary. The surrealists tried to depict the world without rules for how to paint it.

Student and Instructor Responses to Emotional Motivational Feedback Messages in an Online Instructional Environment

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ABSTRACT
The purpose of this study was to investigate the effectiveness of Emotional Motivational Feedback Message (EMFEM) in an online learning environment. This exploratory research was conducted using mixed method single case study design. Participants were 15 undergraduate students enrolled in an instructional technology course in a large state university located in an urban region in the southeastern part of the United States during Fall 2013. Multiple data collection strategies were employed in this study such as a course interest survey, IT attitudes survey, open-ended questionnaires, research journals, forum/discussion postings, emails, reflection papers and warm-up surveys. The findings showed EMFEM helped to increase and maintain students' motivation. Students liked the EMFEM and the style of the instructor's teaching by giving emotional motivational feedback. Students had a closer and friendlier relationship with the instructor; they also started to use more emotional content themselves.

1. INTRODUCTION
Feedback, an important technique for learning, has been recognized as responses to students' behaviors, tasks, assignments, and outcomes. Sprenger (2005) defined feedback as assistance to students in helping them know where they are in the learning process. Feedback can affect students in many ways, including improving learning (Askew, 2000; Cheng, Liang& Tsai, 2015;Mory, 2004; Sprenger, 2005), motivation (Connellan, 2002), and emotion (Burke & Pieterick, 2010). In traditional (face to face) classrooms feedback is a rapid, fluid, and almost constant process of natural interaction between the instructor and students. But in online environments the communications channels for feedback are generally somewhat constrained, making it more important that feedback be approached deliberately and with an eye to maximizing the efficacy of the limited feedback opportunities.

Emotions are important factors in learning because they affect students' success (Burke & Pieterick, 2010; Meyer & Turner, 2006), motivation (Hannula, 2006) and satisfaction (Cho & Heron, 2015). Emotions also give clues to educators about what is happening in classroom environments during instruction (Meyer & Turner, 2006).

Connellan (2002) identified three different types of feedback: motivational, informational, and developmental. The different types of feedback help students remain engaged in the learning process (Askew, 2000), but motivational feedback messages are one of the most powerful types of feedback (Connellan, 2002). Many researchers have investigated how feedback messages improve student motivation levels and keep them highly motivated (e.g., Borham-Puyal & Olmos-Migueláñez, 2011; Brookhart, 2008; Kim & Keller, 2008; Nicol & MacFarlane-Dick, 2006; Van den Bossche, Segers, & Jansen, 2010). Motivational feedback messages can help students during the learning process by encouraging them about their progress (Sprenger, 2005). The reactions of students to motivational feedback are generally emotional (Burke & Pieterick, 2010). These emotional reactions help students see feedback as a personal message, which makes it a powerful tool to keep them more motivated (Kim & Keller, 2008).

In this study, we used an Emotional Motivational Feedback Message (EMFEM), which provides feedback by using motivational strategies and adding specific emotional content. EMFEM could be important to motivating students because it could affect students both extrinsically (as a reinforcement) and intrinsically (as an encouragement). Extrinsically, EMFEM provides reinforcements from the instructor to the student for doing

better and/or improving their learning activities, leading to the student's being motivated to continue in the same manner (Ryan &Deci, 2000). When the student internalizes those reinforcements, coming to understand that because they have learned successfully in the past, then they can learn successfully in future tasks, they become "moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards." (Ryan & Deci, 2000, p.60).

An Emotional Motivational Feedback Message is a feedback message which includes both motivational strategies and emotional content for motivating and encouraging students to seek to learn more about a specific topic. Kim and Keller (2008) investigated motivational feedback messages in online learning environments by using motivational components of the ARCS model (Keller, 1987), and adding volitional components such as Gollwitzer's Rubicon model, (Gollwitzer, 1999), Kulh's six action control strategies (Kulh, 1987), and Visser and Keller's (1990) strategy of motivational messages, to design feedback email messages. This study was based on the ARCS model because that model has long been used for designing motivational messages (e.g., Kim & Keller, 2008; Visser & Keller, 1990). In addition, research shows that the ARCS model works efficiently for designing motivational feedback messages (ChanLin, 2009; Cheng & Yeh, 2009). In this study we used a few different and additional components to explore the effectiveness of EMFEM, which is grounded in feedback strategies (Brookhart, 2008), Visser and Keller's (1990) motivational message design (which was influenced by Keller's, 1987, ARCS theory), and emotional content strategies (Ekman, 2003; Goddard, 2011; Kappas & Krämer, 2011).

Instructors must pay attention to emotion in online learning because in education, it helps to support students in achieving their goals (Meyer & Turner, 2007; Yunus, Osman, & Ishak, 2011). Emotions can be transferred in many ways, such as using facial expressions and mimicry (Ekman, 2003; Marinetti, Moore, Lucas, & Parkinson, 2011; White & Gardner, 2012), gestures/postural movements (Marinetti et al., 2011; White & Gardner, 2012), and verbal emphasis (Marinetti et al., 2011; White & Gardner, 2012). Unfortunately, these techniques are not applicable in text-based asynchronous online learning. Text-based options to facilitate the transfer of emotions include considering the semantic value of words (Farrell, 2012), bold/colored/underlined typing (Dweck, Mangels, & Good, 2004), and emoticons (Kappas & Krämer, 2011; Sarsar, 2008; Sarsar & Kisla, 2013). Because online learning environments are still mostly text-based learning environments, ways of adding emotional content to online feedback messages are limited. Using the meaning of the words, formatting the words by using font effects, and adding emoticons to get students' attention are some strategies that can infuse emotional content into messages.

1.1. Semantic value of words. The meaning of words may affect students' emotions (Anusha & Sandhya, 2015; Goddard, 2011). While giving feedback, each word has a specific meaning to the students. If a teacher writes "this is great work," it might make students feel happy. Whereas "this is good work" might elicit a positive but less pronounced response. Ekman (2003) highlighted that words are the primary way of representing emotions in text-based feedback; therefore, the selection of words is important in generating an emotional response.

1.2. Font effects. Using font effects is another option to make messages emotional. This is one of the true affordances of online learning environments. The majority of online environments use word-processing editors which allow both teachers and students to write their feedback using italic, bold, and/or colored text. Price, McElroy & Martin (2015) stressed that font effects might improve students' recall performance. Kalra and Karahalios (2005) noted that different textual representations, such as different colors, font types, size, and format, can help to express emotional content.

1.3. Using emoticons. Emoticons are another way of expressing emotions online (Dunlap, Bose, Lowenthal, York, Atkinson & Murtagh, 2015; Kalra & Karahalios, 2005; Kappas & Krèamer, 2011; Sarsar, 2008; Tossell, Kortum, Shepard, Barg-Walkow, Rahmati & Zhong, 2012). However, commonly used emoticons have been more limited than the number of emotions in use. Tossell et al (2012) stated that the top three emotions are happy (":)"), sad (":("), and very happy (":D"). The other emoticons that have been commonly used are Joyful :p, Wink/Joking ;), Surprise :o, Anger :-[, and Uncertainty :-\ (Garrison, Remley, Thomas, & Wierszewski, 2011).

Emotion can be adaptable to all steps of the ARCS model, potentially making feedback more personal and more motivational. Using the three most common ways of expressing emotion in online environments might assist students because if the teacher would like to stress a point of view, he or she can make it bold, italic, in a different color, and/or use the emoticons to make message more emotional.

There are many studies on feedback, motivation, and emotion in online learning environments; however, there is limited research on the effectiveness of motivational feedback email messages, and a review of the literature in preparation for this study revealed no research on effectiveness of emotional motivational feedback email messages. Visser and Keller (1990) designed a clinical use of motivational messages to help adult learners in an in-service continuing education program. They modeled their study as an embedded single case study by using mixed method design to implement and test motivational message design of the ARCS model. They used a variety of data collection tools, such as weekly questionnaires, round-table discussions, observations, and grades. They had 15 adult participants and the results showed that motivational message design provided positive influence on students' motivation to learn. They also found the retention rate and students' performance improved.

With a similar interest, Kim and Keller (2008) investigated the effectiveness of supportive information by using motivational and volitional email messages which were based on different theories and methods, such as Keller's ARCS model, Kuhl's action control theory (Kuhl, 1987), Gollwitzer's Rubicon model of motivation and volition (Gollwitzer, 1999), and Visser and Keller's strategy of motivational messages (Visser & Keller, 1990). Motivational and volitional email messages were sent to 30 students (Personal Message Group) with personal messages and to 71 students (Non-Personal Message Group) without personal messages. The results showed that the personal message group evinced a higher level of motivation, especially in regard to confidence, than the Non-Personal Message Group. Kim and Keller conducted another study to examine the effectiveness of motivational and volitional email messages on pre-service teachers' motivation, volition, and performance, in addition to their attitudes toward technology integration (Kim & Keller, 2010). Fifty-six pre-service teachers participated in this study. The results signified that motivational and volitional email messages worked as an effective tool for facilitating pre-service teachers' positive attitudes toward technology integration and supported a higher volition and more positive attitude toward technology integration.

In another study, Sampasivam and Wang (2012) determined that their learners' math test anxiety was associated with changes in their achievement goals and task-specific emotions in response to different types of feedback. Ninety-five students participated in their study, and were randomly assigned to a Negative Feedback Condition, Positive Feedback Condition, or Control condition. The results showed that there was no significant difference in interaction between feedback condition and math anxiety, and multivariate effects for both math anxiety and feedback condition, but feedback had a significant effect on participants who received positive feedback, while students in the negative feedback condition reported the most negative effect.

Terzis, Moridis, and Economides (2012) explored the effect of emotional feedback on behavioral intention to use computer based assessments (CBA). They used a virtual agent for giving emotional feedback. The agent appeared female, and was rendered in 3D to express common facial emotions, such as sadness or fear. They administered a survey questionnaire to134 students. They observed that emotional feedback had a direct effect on behavioral intention to use a CBA system and on other crucial determinants of behavioral intention. This study highlighted that emotional feedback makes computer-based assessments seem playful and easy to use.

Researchers (e.g., Maier, Wolf & Randler, 2016;Pintrich & Schunk, 2002; Schutz & Pekrun, 2007) have shown that emotions in education affect students' achievement and motivation. However, there is limited research on emotions in online education, especially in text-based asynchronous online learning environments, and this study contributes toward closing that gap in the literature.

The purpose of this study was to investigate the effectiveness of EMFEM in online learning environments. This exploratory research employed a mixed method, single case study design. Visser and Keller's (1990) motivational message design, which was influenced by Keller's (2010) ARCS Motivational Design Model, was selected as the theoretical framework for this study. This study was designed to investigate the effectiveness of EMFEM on students` motivation, and attitudes in online learning environments with the intent of addressing the following research question: How effective are emotional motivational feedback messages in an online learning environment?

2. METHODOLOGY

To investigate the effectiveness of emotional motivational feedback messages in an online learning environment, we collected data within a case study of an undergraduate online course taught at a large university in the southeastern United States. The course provides training in contemporary computer skills, including topics such as information literacy, cyber ethics, spreadsheets, and web design. The course included 20 students, 15 of whom agreed to participate in the study after signing informed consent documents.

2.1. Participants

The 15 participating students were in two academic areas: 11 were majoring in Exercise Science (which required this course as part of the program of study), and 4 were majoring in fields in the Department of Communication (which allowed the course to count as an elective). Ten of the students were male, and 5 were female. At the beginning of the course, participants completed Keller's (2010) Course Interest Survey, which consists of 34 items identifying 4 subscales of interest (attention, relevance, confidence, satisfaction). Possible total scores can range from 34 to 170. In this sample, the minimum score was 102, and the maximum score was 158, with a mean of 133.40 (SD = 18.44). The mean for female students, 139.40 (SD = 10.00) was greater than the mean for male students, 130.40 (SD = 21.32), but the difference was not statistically significant ($t(13) = .884$, $p > .10$) within this small sample. The mean for Exercise Science students, 135.18 (SD = 19.15) was greater than the mean for Communication students, 128.50 (SD = 17.92), but this difference also failed to evince statistical significance ($t(13) = -.606$, $p > .10$).

2.2. Setting

The online computer skills class that provided the setting for this study was a 14-week, 3 credit hour course offered through the University's online learning management system (LMS). Students registered for the course during the University's regular registration period, just as they would for a traditional, face-to-face class. The lead author served as the instructor for this course. Over 13 weeks, students submitted weekly assignments, and they submitted reflection papers during the 14th week, giving ample opportunity for the instructor to provide emotional motivational feedback. Feedback on assignments was delivered through the "Dropbox" area of the course site, and it consisted of a numeric grade along with written feedback. Additionally, students communicated with each other and with the instructor through emails, the feedback box, and discussion/forum postings. During this section of the course, the instructor published approximately 150 emails, 250 forum postings, and 300 feedback messages, although only those involving study participants are considered in this report.

2.3. Procedures

At the beginning of the course, students completed the Course Interest Survey (Keller, 2010) and the Information Technology Survey (Wong, 2002), which measures participants' attitudes toward information technology. The survey consists of 24 Likert-type items with possible scores ranging from 1 (*strongly disagree*) to 5 (*disagree*). Additionally, we administered a questionnaire of 10 open-ended items designed to further investigate students' motivational factors and attitudes toward information technology and the course.

Also at the beginning of the course, we administered three mini-surveys to determine how familiar students were with using emotional content strategies. These surveys asked about color preferences, typing/font style preferences, emoticons, and encouraging and discouraging words. Results from these surveys guided the instructor (first author) in his creation of emotional motivational feedback messages throughout the course.

Each week of the course, students engaged in the instruction provided and then responded through their assignments, discussion board postings, and emails. After the instructor evaluated their contributions each week, he responded to them with emotional motivational feedback messages, which he had created using the mini-survey results, Keller's (2010) ARCS strategy, feedback strategies (Brookhart, 2008), and emotional content. Brookhart (2008) identified four strategies—timing, amount, mode, audience—that were used throughout the course. The feedback messages were given after each assignment and on a weekly basis. They covered main points and level of achievement of major course objectives. The instructor sent feedback messages individually using email-messaging or other relevant tools.

Table 1.Constructing Emotional Motivational Feedback Messages Using Keller's (2010) ARCS Model

Stage	Description	Key Concepts	Example Text Emotional Motivational Feedback Messages
Attention	Capturing interest	● Write student's name at beginning of message ● Use humor	John, Thank you for sending this GREAT home-work. ☺

Relevance	Meeting the personal needs and expectations for positive attitude	● Identify goal of previous assignment ● Describe relationship between goal and activity ● Describe relationship between activity and student's field.	This homework was about the ways of using MS office Word efficiently. All of us using one of word editors to save our documents electronically. I am also one of them. ☺ You are majoring in health care, so it was a very good opportunity for you to learn how to use this software for reporting the health information of your patient!
Confidence	Awareness of achieving and controlling success	● Confirm meeting of expectations ● Give advice regarding improvement of skills ● Provide information about quality and correction (if needed)	You met all the expectation of this small activity. ***YAY!*** We used MS Word, but I recommend you to try Open office as well. You will see that you can do the same kind of tasks using other word editors.
Satisfaction	Reinforcement	● Provide grade for assignment ● Praise student effort	This excellent homework got 6 full credits!!! YOU did a **GREAT** job. I know that you will do the same for others. ☺

Keller's (2010) motivational strategies were reflected mostly in the structure of content, which was focused, clear, personalized, and brief. Because the students received feedback as
they were beginning the next week's instruction, the instructor used motivational strategies to encourage their learning activities. Table 1 shows the phases of construction of a motivational feedback message and an emotional motivational feedback message using Keller's ARCS model. Additionally, we felt it important to provide personalized but brief feedback, as longer feedback messages risk becoming tedious and confusing.

Once the motivational feedback messages were created, the instructor introduced additional emotional components using three strategies: selecting words for their positive connotations, using font effects, and adding emoticons. The students had identified words with positive connotations in the mini-surveys, and the instructor made use of these. Font effects included using boldface, italics, underlining, colored text, colored backgrounds behind texts, or punctuation. Emoticons are computer images created using standard keyboard keys. For instance, **:)** represents a smiling face (☺) when viewed on its side. Emoticons are popular in online forums and in text-messaging.

2.4. Data Collection and Analysis

Quantitative data were collected primarily through two instruments, Keller's (2010) Course Interest Survey and Wong's (2002) Information Technology Survey. Qualitative data were collected through the various assignments, discussion postings, and email messages previously described. Additionally, qualitative data were collected through open-ended questionnaires, the instructor's electronic research journal, the mini-surveys, and end-of-course reflection papers.

Because our sample size was small, we analyzed the quantitative data from the surveys using a descriptive analysis approach, identifying differences between subgroups of the participants, while understanding that these differences would not be generalizable to larger populations because of our purposive sampling strategy. Results of the quantitative analysis contribute to a detailed description of the research setting and participants, information readers can use to assess the transferability of the results.

Because of the large number of text documents providing qualitative data for the study, we used content analysis to analyze them. As the main focus of the study was a new topic in online learning environments, content analysis was appropriate because it can lead to the development of a framework to categorize codes that then help conceptualize the content of the texts (Ulrike, 2010). We used Schreier's (2012) description of the steps for content analysis to guide recursive analysis. We began by looking at the raw data for theme codes. When we had accumulated a number of codes, we used them to create a code sheet, and we sorted the data into categories. We used the code sheet to analyze the next group of data and then compared these results with previous results in the data collection. Once we created a draft code frame and categories, we sent the code frame and a sample of data to two colleagues for their review. Finally, the results from the peer reviewers were compared and the code frame was finalized. After data coding finished, we abstracted the data.

Our data collecting involved multiple data sources (multiple participants who produced multiple types of texts), creating a triangulation (Krefting, 1991; Merriam, 1998) of results to contribute to the credibility of the study. We relied on peer review, as described above and in debriefing sessions as we conducted the study, to strengthen the dependability of the study. The instructor kept detailed notes in his research journal and during coding sessions in order to create an audit trail describing the research process as it occurred. These characteristics along with the descriptions we provide for the purposes of transferability evaluation support the trustworthiness of our results.

3. FINDINGS

In this section, we present the baseline data we collected using the mini-surveys, and then we present the outcomes of the study group according to specific themes that appeared most prominently in our content analysis of the course texts. The baseline data presented here addresses the three primary strategies for including emotional motivational feedback messages in an online course, providing information about the participants' experiences and attitudes toward the various feedback techniques. The outcomes are presented in the following categories: motivation, attitudes, instructor's role, emotional reflection, and feedback.

3.1. Baseline Data

The three mini-surveys conducted at the beginning of the course provided an understanding of students' previous experience with the emotional motivational feedback strategies we studied: word choices, font effects, and emoticons. These data provide a description of the students as they began the course and provided guidance to the instructor as he designed emotional motivational feedback messages during the course.

3.1.1. Word Choices. Given a choice of potential feedback for an assignment, most student participants selected the choice they characterized as motivating ("This assignment should be improved, but I believe that you could do better.") over the choice they characterized as honest ("This assignment is not good enough, but I believe that you could do better."). One participant preferred what we intended as a negative phrasing ("This assignment is bad, but I believe that you could do better.") but only explained this preference as a "personal choice."

Participants identified a number of words as positive, as making them feel happy when they heard them. The five most frequently appearing words were "excellent," "wonderful," "great," "beautiful," and "perfect." Similarly, we asked them to identify negative words, words that might make them feel upset when they heard them from somebody, and the five most frequently occurring of these were "bad," "terrible," "horrible," "awful," and "stupid."

3.1.2. Font Effects. In the mini-surveys, participants mentioned that colored text, italics, and boldface can emphasize the importance of the meaning of texts. However, students differed on how they interpreted that importance, particularly with regard to colored text. On the mini-survey, colored text was represented as an option using red, which, for one student, conveyed a positive emphasis "because it is a different color, which stands out the most among the other fonts." However, another student felt it a negative influence "because the red throws me off a bit. Red is usually associated with something bad/negative." His opinion was shared by another participant, who also discussed other font effects from the mini-survey:

> I like GREAT [the sample word] bolded and capitalized. It affects me positively and makes me feel like I did a really good job. Black is always a safe professional color to use especially for bold. I like colors bolded as well, and I wouldn't mind them used, but not in red. I associate red with correction and wrong doing so seeing GREAT in red creates a confused reaction for me.

How students felt about using colored fonts for emphasis was confounded by the fact that a number of students had negative associations with the particular color being discussed (red). The participants might have had more positive things to say about a different font color, such as blue or green, although some participants might have had negative associations with one or both of those colors as well.

The participants suggested a number of ways they might themselves use font effects in feedback they provide. One wrote, "I would use them because they would be a great way to highlight the key points in the feedback." Another viewed the font effects as useful as a back-up plan: "I may use it if the student seems to not notice the first few feedbacks about what I'm trying to hint towards." A third student emphasized how font effects might be particularly relevant in online learning environments: "It is exciting and since you do not have face to face time together it is nice to give variety to students." And one student described a specific scheme for using different font effects in feedback:

I would use it on a word that could sum up the whole point. That way if students don't take the time to read the feedback, they will at least see the one word and know what the instructor felt about their assignment

3.1.3. Emoticons. Most participants reported that they had used emoticons, with 6 of them reporting that they use emoticons sometimes and 7 reporting that they use emoticons often. However, 8 of the 15 participants indicated that they did not feel emotionally connected when they used emoticons in learning environments. For instance, one wrote,

> I feel weird using these with professors since I use emoticons in an unprofessional friendly setting. School is like a job for me that is professional. I like using emoticons, but in class I feel like I have trained to never use things like that. However, I feel more connected when using them in everyday life, but in class or work it's just a different setting.

For this student, using emoticons conflicted with the expectations he had developed regarding the professional nature of collegiate learning. Another student identified a similar restraint: "Sometimes, it just feels weird," she said, "because teachers have told us to refrain from it for so long. But when I get more used to it, I'll probably be more emotionally connected."

In contrast, a third student identified a reluctance to use emoticons based on the medium itself: "I'm more focused on what and how an individual delivers a message. Emoticons are nice for emphasis and accentuating a message, but some people just like to use it for the sake of using it." She suggests meanings conveyed by emoticons may be diminished by their overuse by some communicators.

3.2. Outcomes

3.2.1. Motivation. At the end of the course, the participants again completed the Course Interest Survey, and the results are presented in Table 2. On all four of the ARCS (Keller, 2010) subscales, mean scores were higher than the subscales midpoint, suggesting a high level of motivation among the participants. More evidence of this effect on motivation appeared in students' responses to the post-intervention questionnaire. "As a college student," one student wrote, "stress hits you from so many different angles and that one feedback message could give you that extra push," suggesting that the feedback messages contributed to his confidence. Another student explained, "encouragement, emotional feedback, is definitely something that allows students to push further in their studies and connect with a professor in a way that makes class enjoyable," suggesting that the feedback messages contributed to her confidence and satisfaction. In her reflection paper, one of the students also described how the feedback messages contributed to her confidence: "It shows that the instructor is staying positive and trying to encourage you to do better."

Table 2. CIS Survey with Subcategories

Subscale	Mean Score	Scale Middle Score	Scale Maximum Score	Out of 5
Attention	29	24	40	3.60
Relevance	36	27	45	4.00
Confidence	32	24	40	4.00
Satisfaction	36	27	45	4.00
Total	133	102	170	3.99

3.2.2. Attitudes. Because this study was conducted within an instructional technology course, we surveyed the participants about the course to see if they had positive feelings about it. The Instructional Technology Attitude survey produced a mean score of 87.80, which is just above the midpoint of the scale, suggesting a slightly positive mean for the group of participants. In their reflection papers, a number of students described their attitudes about the course. One wrote, "I appreciated everything this class was, especially compared to my other classes," and another wrote, "I feel like the course was exactly how I imagined it would be. I learned good quality material that was very helpful and useful as I continued through the course." A third wrote,

> Overall this was a great class to take and one that I would definitely recommend to everyone because it is not your average college class where you sometimes wonder if you are ever actually going to use the things that you are learning in life.

While these statements do convey a positive assessment of the participants' experiences in the course, they do not specifically tie that evaluation to the innovative use of feedback in the course. However, one student did make that connection in his reflection paper:

Although I am not happy with my potential final grade for the class, I was more than satisfied with the professor's attempt at helping me get a better grade throughout the semester.

3.2.3. Instructor's Role. Students' descriptions of their beliefs about the course instructor and the relationship they had with him were evinced in their comments about the emotional motivational feedback messages. For instance, on the post-intervention questionnaire, one student wrote, "I liked it just because it made our relationship more [than] a instructor and student more like a friend level." Another wrote, "They [feedback messages] made me feel like I could contact my instructor whenever, which I did not feel with my other online instructors, because a close connection between a student an instructor is helpful for the student to want to learn." In his reflection paper, one student described the instructor: "Gave great feedback, responded almost immediately to emails and made you feel that you weren't just a student and an instructor but a friend who is helping you to become good at using the computer." Another wrote,

> As the semester progressed I noticed the feedback of [instructor] becoming more personalized, as if he was genuinely concerned with something that I was doing, or the way I was absorbing the material, and I appreciate his individualized attention.

A third student wrote, "This particular course was very interesting for me because I never had an instructor who expresses his feelings and emotions to his students." These comments suggest that instructor's efforts to convey emotional and motivational content within the feedback messages were recognized and appreciated by the students.

As researchers, we were pleased at this kind of response from the students, but, in his research journal, the instructor described some of the difficulties he encountered while trying to provide detailed emotional motivational feedback. During Week 2 of the course, he wrote,

> I am already overwhelmed to write feedback, because I am writing very individually, so I needed to mention very specific points. Writing feedback to one student takes 20 minutes. I think it would be a great to create a new [template] and leave some parts empty for writing individual points.

While creating the new template did help the instructor provide feedback to the students more quickly, it led to another complication. During Week 6 of the course, he wrote,

> Students' expectations are increasing; they email me more and want me to respond very quickly. If I wait one day to respond, they are emailing me again. It is the 6th week of the semester and it is getting more difficult to respond to their emails, because they started to write me more. It is the first time that I am dealing with that many emails.

However, by Week 10 of the course, he himself began to feel emotional and motivational benefits from the frequent communication with his students:

> It is the 10th week and I feel that I have become friends with them. They started to share their daily life with me. Although they haven't seen me, they are sharing important events of their lives with me. I feel more connected while they are sharing more. It is the first time I feel that I know my students better.

For the students, the emotional motivational feedback messages contributed to creating a bond between them and their online instructor, one they may not otherwise have had without face-to-face interaction with him. However, for the instructor, creating this relatable persona through the feedback messages took a great deal of time and effort, but ultimately he found that using the messages helped him relate better to his online students.

3.2.4. Emotional Reaction. Students participating in the study reflected their feelings in different kinds of course texts, such as email messages, reflection papers, and discussion posts. Of the specific strategies for making texts more emotional that we are considering in this study, students mostly used punctuation, particularly exclamation points. Table 3 shows some of the strategies they used. Absent from the table (because students did not use them) are boldface, underlining, and colored text.

Table 3. Strategies for Expressing Emotion

Expression	Frequency	Sample
Marks	84	I maybe we will have class together, good luck and great blog! I hope you have tons of fun in Texas!!
Caps	24	REALLY glad football has started back up!!! I LOVE them!
Emoticons	21	very cool :)

		The blog..... :/
Internet Language	13	Lol! Exactly, I feel you man
Value of Word	12	Finally get to try something I never got to do before haha. chiiiiiiiiiiiiiiiii PS4 babyyyyyyyyyy!!!!!!

Students expressed their emotions about a number of course-related and non-course-related topics. For instance, one student emailed the instructor, saying, "I am very grateful that you were able to [make me] aware of this." Another indicated, "I love that the directions are clear and concise so I know how to format every assignment." Another student, in a discussion post, describes in detail what he was feeling and why:

> This week has been one of my easiest weeks, [except] for the large test I had to study for on Monday, but other than that I had very few hours at work and a small amount of homework. I have nothing to complain about for the week except that it was boring. But everyone needs some boring sometimes

One of the students commented on her fondness for the emotional motivational feedback messages:

> I loved that there was feedback after most assignments because it gave me more of an understanding of what was expected and how well I was doing. I also liked that there was frequent communication from the instructor.

This sharing of emotions evolved over time, according to the instructor's research journal. During the first week, he observed that the students were "not ready to talk about their emotions," but by Week 4, he realized, "When students see that I am comfortable [using] emoticons and typing formats, they started to use them as well. I think they were waiting for my move." By Week 8, he had observed transformations in the students' communication patterns:

> I think I started to change something in their lives. At least they feel free to talk about their daily lives' issues with me. They don't know me, I am just an online instructor for them but I also feel that we are getting closer and started to know each other better. I know some of their struggles and their problems. It makes me feel like more of a teacher.

Thus, the emotional opening up of the students led to similar feelings within the instructor, who wrote in Week 9, "Isn't it good [when] one of your students [compliments] how you are taking care of your students? Yes it is. It made my day and I feel that I am connected with my students."

3.2.5. Feedback. Students found the feedback message important as a course component, one that was innovative compared to other courses they had taken. For example, in her reflection paper, one student wrote,

> This course also introduced me to emotional feedback. I noticed that my instructor's feedback style was very different from my other instructors' feedback. His style was way more personal and unique.

Another student, also in her reflection paper, wrote, "This encouragement and feedback also sparked motivation to keep doing well on my assignments." One student appreciated that he was able to provide feedback to the instructor throughout the course and that he received the same:

> Normally I give my feedback at the end the semester but this class wants the students to give feedback during the semester which is good because then the class itself can [make] improvements throughout the semester. One thing that is also good is the constant feedback every time I do an assignment.

Students recognized the feedback messages as important components of the course, as opposed to evaluative statements, such as grades, to which they could not respond. "The instructor did send friendly and personalized feedback which helped," one student wrote in his post-intervention questionnaire.

A particular aspect of the feedback messages that students appreciated was personalization. Even when he was using a template to fashion messages, the instructor addressed students by name and included information specific to their assignments and backgrounds. In the post-intervention questionnaire, one student wrote, "it is an encouragement to read a personalized feedback," while another observed, "I would not expect personalized feedback from other instructors." One student wrote that the instructor's "feedback made me feel like he actually took the time out to personally read our work and respond." Several students expressed their appreciation of personalized feedback in their reflection papers.

As previously mentioned, the instructor started to become overwhelmed with the amount of effort involved in providing feedback that reflected the ARCS (Keller, 2010) model, but he also recognized the benefits of putting in that extra effort. In his research journal, the instructor described some of the effects of feedback on the way students were performing. In Week 7, he wrote,

> Writing a long feedback response is not a fun part of teaching but it is an essential part. It takes time, but I feel that my students are learning by reading feedback. Some of them are writing me back to ask if there is a chance to re-do their homework again.
> In Week 9, he recorded the following insight:
>
> Feedback is a very important tool for online learning, especially when your students cannot see you. They only know me by my feedback. I wonder what kind of instructor I am in their mind right now. I am very excited to read their reflection [papers].

In an educational institution, feedback, at least in the form of evaluative grades, is required. However, in this case, where the instructor was specifically infusing emotional and motivational content within the feedback he provided, the work-intensive process of providing feedback led to reflection of himself as a better, more involved instructor, one he hoped the students recognized as well

4. DISCUSSION

An emotional motivational feedback message (EMFEM) is defined in this study as a feedback message which was the combination of motivational strategies using ARCS model (Keller, 2010) and emotional content strategies: using emoticons (Kappas & Krèamer, 2011; Tossell et al 2012; Dunlap et al, 2016), formatting words (Kalra & Karahalios, 2005), and using the semantic value of words (Goddard, 2011; Anusha & Sandhya, 2015).

The results of this study suggested that EMFEM contributed to an increase in students' motivation. The Course Interest Survey (CIS) revealed that students were motivated during the online class. The CIS had four subcategories, attention, relevance, confidence, and satisfaction. They were measured individually in this study. Although all categories were higher than the midpoint of the survey, attention was slightly lower than the other three subcategories. Keller (2010) gives three main strategies to arouse and sustain attention. These strategies are perceptual arousal by using novel, surprising, incongruous, or uncertain events; inquiry arousal by having the learner generate questions, or a problem to solve; and variability by varying the elements of instruction. One of the strategies was to arouse attention in these kinds of environments to start writing messages by using the students' names, as Kim and Keller (2008) highlighted in their studies. However, because of the nature of the course, assignments were designed weekly and feedback was mainly given after assignments. This meant that there was an entire week that students were engaging with their assignments. During a week, students' attention might shift often. Additionally, students had more than three courses for the semester and some of them were taking an online course for the first time; therefore, their additional course load and lack of seeing the instructor might have affected their attention. Overall, students' motivational level was increased. EMFEM was one of the catalysts for this increase during the study. These results are consistent with with Maier's et al. (2016) study. They found that elaborated feedback related to intrinsic motivation.

EMFEM had two powerful components: Emotional and Motivational strategies. Emotion and motivational strategies might affect students' motivation by using them individually and also, as shown in this study, by using them together. During the study, students mentioned that it seemed that EMFEM from their instructor motivated them in many different ways (i) EMFEM facilitated having a closer relationship with their instructor, (ii) EMFEM encouraged students to do their work better and (iii) EMFEM led to additional enjoyment in the course. The similar results reflected in Sampasivam and Wang's (2012) study mentioned that feedback had a significant effect on participants who had positive feedback, and students in the negative feedback condition reported the most negative effect.

The result of the IT attitude survey showed that students' attitudes toward the course improved by the end of the course. The other data also supported this statement. The CIS showed that satisfaction, as one of the subcategories of CIS, increased during the course. Students' attitudes might be one of the indicators which was related to students' satisfaction, as it was highlighted that e-learners' satisfaction related to learners' attitudes toward IT (Sun et al., 2008) or the course in this case. This finding also dovetails with the studies of Terzis et al. (2012) which highlighted that emotional feedback made computer- based assessments playful and easy to use. Similarly, Cho and Heron (2015) found that emotion played an important role in explaining students' satisfaction.

Another aspect of positive attitude towards the course might be the effectiveness of EMFEM. Students' reflection papers showed that students enjoyed having EMFEM during the course. They also reflected their positive attitude towards the course by mentioning how they liked to be in the class. This finding is consistent with Kim and Keller's (2010) study, in which they highlight that motivational and volitional email messages can facilitate students' positive attitude toward technology integration.

Personalization was one of the important effects of EMFEM. Gallien and Oomen-Early (2008) define personalized feedback as a feedback message which is given individually. This result might be explained under the title of feedback; however, it might be better to explain it separately for considering the limitation of asynchronous online learning environments and effectiveness of the feedback messages. There were several strategies applied in this area during this research. These include (i) mentioning students' names in each EMFEM; (ii) mentioning specific information about them such as their field of study in the first EMFEM; (iii) giving specific points of their assignments in each EMFEM; and (iv) using emotional and motivational strategies. Students mentioned that EMFEM helped them feel personalized. On the other hand, personalized feedback messages might affect students' satisfaction, as noted in Gallien and Oomen-Early's (2008) study. They highlighted that students who received personalized feedback were more satisfied and performed academically better than students who received only collective feedback.

One of the challenges of motivation in online classrooms is to make students feel that the instructor is addressing their individual needs. Lack of instructors' personal attention might affect students' motivation (Kim and Keller, 2008). Students in this study noted that they would like to have personalized feedback messages in other classes as their instructor in this class had done. That way, they felt encouraged when they knew that the instructor gave his attention to all students' work, read it and responded individually. As the instructor, the first author noted that personalized feedback was a part of the EMFEM, which made them feel like they belonged in the learning environment and encouraged students to do their work better. These results also overlap with Kim and Keller's (2008) study. In their study, they highlight that personalized motivational volitional emails might be useful supports for improving students' motivation.

5. CONCLUSION

This study focused on determining the effectiveness of EMFEM which was defined as a feedback message combining motivational and emotional content strategies. Results showed that (i) students' motivation was increased; (ii) students' positive attitudes toward IT increased; (iii) students liked the EMFEM and the instructor's teaching style; (iv) students had a closer and friendlier relationship with the instructor; (v) by the end of the course, students were satisfied with the course; (vi) students started to use more emotional content; (vii) students enjoyed having personalized EMFEM and requested to have more EMFEM; and (ix) students had positive experiences by the end of the course.

Online instructors should be aware of their students' needs, perhaps by answering a few questions such as: what, when and how the students would like to learn. The other important question is to ask what kind of instructor students want. This question may be especially important for online instructors. They should ask themselves —what kind of instructor am I? In this study, the instructor chose to be friendly, social, and responsive. The results of this study should be considered in this light. Students' responses, their interaction with the instructor and their feelings toward the instructor were related to instructors' teaching skills, personality and educational philosophy.

In future studies, researchers should be aware of the relatedness of online instructors' decisions about their teaching roles in online learning environments. This study, despite its limitations, provided an assessment of a new kind of feedback message for online learning environments. EMFEM was supported by emotional content and motivational strategies for encouraging students during the course. Further research might clarify how EMFEM works in online learning environments and explore strategies for making instructor use of EMFEM more efficient.

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Students with Special Educational Needs and Assistive Technologies: A Literature Review

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ABSTRACT
The term *assistive technologies* refers to the equipment, devices and apparatus, and the services, systems, processes and adaptations made to the environment that support and facilitate their functions, used by persons with special education needs. This study is a literature review of the use of assistive technologies in the education of students with special educational needs. To compile the works related to this subject, electronic databases, journals and other relevant sources were curated. The applicable information found within these sources was then analyzed under two general themes: a) the use of assistive technologies, and b) assistive technology implementation models. The results of this study shows various types of assistive technology are used in special education and the use of assistive technologies generally have a positive effect on the students with special education. The results are discussed within the framework of the use of assistive technologies in special education and model implementations with the aim of contributing to the current assistive technology implementations presented in the literature.

Keywords: Assistive technologies, assessment of assistive technologies, technology, students with special needs, special education.

INTRODUCTION

Technological developments have led to important transformations in many aspects of life, not least of all education. The technologies used in special education have significantly changed over the course time (Edyburn, 2001). Assistive technologies in particular have helped to facilitate the skills that persons with special educational needs struggle to utilize in daily life (Gierrach and Stindt, 2009).

In the education process, assistive technologies offer various solutions in providing students with support that meets their needs (McKnight and Davies, 2012). These assistive technologies significantly contribute to aiding persons with special educational needs in learning, building self-confidence, being independent and achieving a high quality of life (Reed, 2007). Furthermore, they serve as key tools for enabling students to access education, actively and independently participate in the education process, interact with their peers and have control over their own learning experiences (Winter and O'Raw, 2010). The use of assistive technologies helps to facilitate the improved performance of the students by providing support, such as adapting content and activities of the curricula, specific to their needs within a minimum-restricted environment, (Wojcik and Douglas, 2012; Parette and Peterson-Karlan, 2007; Parette, Stoner and Watts, 2009). In short, assistive technologies serve to increase both the functional performances and the academic success of the students (Edyburn, 2005; Edyburn, 2006; Alnahdi, 2014).

Assistive technologies are defined in various ways in the literature. Hersh and Johnson (2008a) define assistive technologies as the equipment, devices, apparatus, services, systems, processes and modifications made to the environment for use by disabled and/or elderly people to secure their full, active and easy participation in society. Winter and O'Raw (2010), on the other hand, define them as the equipment, tools and product systems used to enable improvement of the functions of disabled people. According to Lancioni et al. (2013), assistive technologies are various devices whose aim is to help the disabled and persons with special educational/rehabilitation needs to better function in daily life and attain a higher quality of life.

During the education process, the needs of persons receiving special education show variance. Technologies such as voice recognition applications, mobile devices, symbol-based interaction and virtual reality may be used to support persons with different educational needs during their education process (McKnight and Davies, 2013). A range of technologies can be used to support students in reading, writing, walking, sitting, seeing and hearing and

in fostering communication skills and participation in activities (Reed, 2007). These technologies that support active participation in the learning environment rapidly change and develop (Lahm and Sizemore, 2001).

This study aims to review the literature on the implementation trends and models of assistive technologies in the education process. Two themes were developed to govern the review of the literature: a) assistive technologies used, and b) implementation models of the assistive technologies used for providing assistive technology support for the students with special educational needs. The study questions determined according to the general themes are:

a) Which assistive technologies are used in special education?
b) What are the assistive technology implementation models in special education?

METHODS

Study Method

The use of assistive technologies in special education is a newly-arisen area and the relevant issues have relatively recently been taken into consideration (Edyburn, 2001). Generally, assistive technologies aim to help people perform the actions they need in their daily life more easily and successfully (Edyburn, 2005). To enable students with special education to be successful during their education, appropriate services as well as access to the relevant technology should be provided (Kentucky Department of Education. 1997; Edyburn, 2008). The use of assistive technologies and the themes of assistive technology models in special education were determined to analyze the assistive technology models setting the framework of the services provided during education via the assistive technologies existing in the literature. The studies in the literature related to the use of assistive technologies by students with special educational needs were analyzed within the framework of two general themes.

Electronic databases and two journals were curated to create a general profile of the assistive technology implementation trends in the education process. It is recommended to select the journal which will be included in literature reviews among the journals with high quality or specific to the study area (Singh, Haddad and Chow, 2007). This study included the Journal of Special Education Technology, which publish the technological practices, research and policies in special education, and the International Journal of Special Education, which publish original articles in special education.

A literature review is the process of searching quality academic literature databases in order to access applicable research manuscripts (Levy and Ellis, 2006). Webster and Watson (2002) noted that *"a systematic search should ensure that you accumulate a relatively complete census of relevant literature'(p.16).* To access the studies and publications on this subject, a search of the databases of ERIC (http://eric.ed.gov/), Google Academic/Google (http://scholar.google.com.tr/http://google.com.tr/), Springer(http://link.springer.com) and ScienceDirect (http://www.sciencedirect.com/) was conducted, where the keywords used during the search were *assistive technology*, *guide for assistive technology*, *assessment of assistive technology*, *technology*, *ICT*, and *persons with special educational needs*. The academic databases used in this study were selected considering the opportunity to provide access to comprehensive educational (ERIC) and multidisciplinary (Springer, ScienceDirect, Google School) articles and publications.

A review was performed of the publications found in the electronic pages of the Journal of Special Education Technology and the International Journal of Special Education dated between 2010 and 2015.Assistive technology guides from technology centers in the USA and UK, and other guides and reports were also accessed, in addition to the studies and books on assistive technologies found in the scanning of the databases.

Selection

The English-based documents were selected by considering the title and the information in the abstract/content as they related the general themes of the use of assistive technologies and implementation models. This study included the results of the analysis of the studies (n: 49), guides (n: 14), books (n: 4), and reports (n: 2) dated between the years 1995 and 2015. A total of 48 sources from the electronic databases of ERIC (n:3), Springer (n: 2), Google Scholar/Google (n: 42), and Science Direct (n: 1), and 21 articles from the Journal of Special Education Technology (n:16) , and International Journal of Special Education (n: 5) were included in this study.

While the term "persons with special educational needs" was used in this study, it was determined that the use of the term "disabled/disability" in the sources analyzed remain unchanged when referred to in this study.

FINDINGS

The Use of Assistive Technologies in Special Education

Today, a variety of assistive technologies are used to bring out the cognitive potential of the students, provide them with communication opportunities, enable the curricula to achieve their objectives and empower the students to participate in the education process. The assistive technologies used in the education process are categorized in various ways in the literature. McCulloch (2004), for example, categorized assistive technologies into low technologies, such as magnifiers and pencil holding devices, and high technologies, such as computers. Some researchers (Day, Dell and Smith, 2011; Gierach, 2009; Reed, 2007; Colleman, 2011) categorize assistive technologies based on the reading, writing, visual, hearing, and communication skills and competence that students are expected to acquire within the education process. McKnight and Davies (2013), on the other hand, proposed that assistive technologies be analyzed by being grouped according to the concepts of 1) users' needs, competences and aims, 2) technologies and capacities, and 3) content (e.g. educational content). Similarly to the main categorization approach of some researchers (Day, Dell and Smith, 2011; Gierach, 2009; Reed, 2007; Colleman, 2011),the sources accessed for this study were analyzed by being grouped according to the basic tasks required in the education process. The assistive technology implementations regarding *communication; reading; writing; mathematics; seeing and hearing skills; positioning-sitting and movement skills; social skills and making use of leisure time; daily life skills; organization and working skills; and computer skills* were compiled from the sources able to be accessed.

Communication: Assistive technologies help to facilitate communication for students with special educational needs in different situations and environments (Cumley, Maro and Stenek, 2009). The methods used to help students who have difficulty in speaking communicate with their environment are called Augmentative/Alternative Communication (AAC). These methods include aided and/or unaided symbols. Assistive technologies provide the students who cannot effectively use speech with various opportunities such as the use of simple communication boards or high technology electronic systems (Cumley, Maro and Stenek, 2009).

Generally, a number of technologies, including communication boards/books with pictures, eye gaze boards/frames, speech generating devices, text-based devices with speech synthesis and picture exchange communication systems, can be used to support persons with communication problems and speech disorders (PECS) (Annex-1) (Coleman, 2011; Reed, 2004; Reed, 2007, Reed, 2009; Reed and Bowser, 2013; McMullock, 2004; Day, Dell and Smith, 2011).

Studies show that the use of assistive technologies support the students' skills required for communication. Rodríguez et al. (2008) reported that communication technologies provided persons with speech disorders the ability to communicate with others. Coleman et al. (2015) found that the strategy of using PowerPoint presentations to teach vocabulary had a positive effect on improving the vocabulary of third-grade hearing impaired students in secondary school. Furthermore, in a study by Ferreira et al. (2013) which analyzed the impact that the assistive technology of computer games had on children with Cerebral Palsy who were unable to speak, the results revealed that the children used the communication forms of sound or facial expressions, suggesting that assistive technologies are important for social interaction.

Reading: Students with special educational needs may experience difficulties in understanding and remembering written texts during the education process (Reed, 2004; Reed, 2007). Assistive technologies facilitate the access of the students with physical, visual or hearing incompetence and the students who have difficulty in communication to reading texts (Fruchterman, 2008). Cumley (2009) recommends the use of tools and strategies that meet the needs of the students with physical incompetence to improve their reading skills and states that for example, the tools and strategies such as 1) Standard texts 2) Books adapted for access, 3) Low-Tech Modifications to text 4) Handheld devices to read individual words, 5) Use of pictures/symbols with texts 6) Electronic Texts 7) Modified Electronic Texts 8) Text readers 9) Scanner with OCR and text reader and 10) Text Reader with Study Skill support can be used for students with physical incompetence. Jansson (2008) expresses that assistive technologies such as audio texts or Braille can be used for students with visual incompetence to support their reading skills. In summary page turning tools, course materials printed in Braille, magnifiers and screen reader software can be used as assistive technologies to support the reading skills of students (Annex 1) (Adebisi, Limsan and Longpoe, 2015; Coleman, 2011; Reed, Cumley and Walser, 2004; Reed, 2007; Reed, 2009; Manning, 2008; Mahajan, 2014; Reed and Bowser, 2013; McCulloch, 2004; Day, Dell and Smith, 2011).

Studies accessed in the literature show that assistive technologies can affect the reading skills of students with special educational needs in different ways. Earman-Stetter and Tajero-Hughes (2010) indicated in their literature review conducted on computer-aided education for reading comprehension skills (between 1985 and 2009) that the use of different kinds of tools in computer-aided education was shown to have a positive effect in most of the

studies. Similarly, in another study conducted by Earman-Stetter and Tajero-Hughes (2011), it was shown that daily computer-aided reading practice positively affected the reading comprehension skills of the students with learning difficulties. Meyer and Bouk (2014) reported that the students believed they read faster and more fluently by using text-to-speech software. The present study found there to be no difference between using and not using this software. Armstrong and Hughes (2012) observed that the reading comprehension scores of three out of five children increased as a result of the story book-reading practices aided by the computer software that had been prepared to support the reading skills of autistic children. Further, Gonzalez (2014) found in his study involving 17 students with reading disabilities that they succeeded in re-telling stories after undergoing e-book reading practices. The pre- and post-practice scores of these students on the multiple-choice reading comprehension questions were shown to be no different.

Writing: Writing skills require certain cognitive skills, such as the ability to bring words together, as well as certain physical skills (Reed, 2007). Nankee, Stindt and Lees (2009) indicated that the assistive technologies and strategies such as 1) Environmental and seating adaptations 2) A variety of pencils or pens 3) Adapted pencils or pens 4) Adapted papers 5) Writing templates 6) Prewritten words or phrases 7) Label makers 8) Portable talking dictionaries 9) Portable word processor 10) Computers with accessibility features 11) Computers with word processing software 12) Alternative keyboards 14) Computers with scanner 15) Computers with word prediction and 16) Computers with voice recognition software can be used in education of writing skills. Various aids, including word processors, tools that facilitate the holding of pens, and computer software, to name a few, are available to support the writing skills of students (Annex 1) (Adebisi, Limsan and Longpoe, 2015; Coleman, 2011; Reed, 2004; Reed, 2007; Manning, 2008; Reed, 2009; McCulloch, 2004; Day, Dell and Smith, 2011).

Studies may have different results regarding the effect of assistive technologies for writing skills depending on the assistive technology used. For example, according to Peterson-Karlan (2011), different types of computer software such as voice recognition, word estimation and text-to-speech, facilitate successful outcomes for students with writing difficulties. Belson, Hartman and Sherman (2013) found that the use of digital pens by persons with learning difficulties positively affected the quality of note taking), while McCartney Prest, Mirenda and Mercier (2010) indicated in their study on the use of symbol-supported computer software in teaching writing to persons with Down Syndrome that using computer software improved their writing speed and quality.

Mathematics: Students with special educational needs can encounter different problems related to understanding and remembering written texts or to completing certain tasks during the education process (Reed, Cumley and Walser, 2004). Obukowicz (2009) recommends the use of the assistive technologies and strategies such as 1) Math manipulatives 2) Low tech physical access tools such as rulers, stamps, and adapted manipulatives 3) Abacus/Math Line 4) Adapted math papers such as enlarged worksheets, graph papers, and guideline papers 5) Adapted math tools such as calculators, adapted measuring devices, and adapted time tools 6) Math "Smart Charts", Math scripts 7) Digital access to math and 8) Math tool bars (Equation editor) in teaching mathematics to students with special educational needs. Different technologies, such as abacus, extended worksheets, and audio calculators (Annex 1), enable students to improve their mathematics skills (Adebisi, Limsan and Longpoe, 2015; Akpan and Beard, 2014; Coleman, 2011; Reed, Cumley and Walser, 2004; Reed, 2007; Manning, 2008; Reed, 2009; McCulloch, 2004; Day, Dell and Smith, 2011).

The study results about supporting the mathematical skills of students with special educational needs show that assistive technologies positively affect these students' mathematical success. For example, Bouck et al. (2015) stated that the use of calculators in mathematics courses positively affected the success of disabled students (learning difficulties, autism spectrum disorder, emotional disorders, health problems etc.). In a study conducted by Bouck et al. (2013) on teaching mathematics through digital audio books and computer software(ReedHear software: audio text, volume determination, digital magnification, tracking the words read),they found that students with low vision succeeded in using the technology and in understanding mathematical texts.

Vision and Hearing: Information derived from the environment is largely based on the visual and auditory senses. Alternative solutions enable persons with visual and hearing disorders to retrieve information (Hersh and Johnson, 2008). There are different technologies that people can use, depending on their specific hearing and vision abilities. For example, some persons with vision loss may need magnifiers or figure-ground color contrast, while others may benefit from materials printed in Braille (Annex 1). (Coleman, 2011; Reed, 2004; Reed, 2007; Reed, 2009; McCulloch, 2004; Day, Dell and Smith, 2011; Jansson, 2008b). Jansson (2008b) stated that persons with visual disorders can be provided with visual information through relief images and maps, while Heckendorf (2009) highlighted that FM devices, hearing aids, visual-stimulation devices and smart phones facilitate access to information in different environments for persons with hearing disorders.

Isaila (2014) analyzed the effect of assistive software for students with visual disability, and emphasized that assistive technologies are important tools and computer-aided education is a preferred method in education. Screen reader program, a type of assistive technologies, provide students with visual disability with access to the information in written texts via computers (Isaila, 2014). Isaila (2014) found that 87.8% of the students who used assistive software in a special education school reported an effective, interesting and interactive learning while 12% of them expressed the use of assistive software as boring.

Positioning, Seating and Mobility: Providing students the ability to sit and move in a manner appropriate to their needs is of great importance. For example, Butler (2009) indicated that assistive technologies help children with motor disabilities to participate in activities with their peers. Stindt, Reed and Obukowicz (2009) highlighted that the assistive technologies such as 1) Walking devices - Crutches/Walker 2) Grab bars and rails 3) Manual wheelchairs 4) Powered scooters, toy cars or carts 5) Powered wheelchairs with joystick or other control and 6) Adapted vehicles for driving can be used to enable mobility.

On the other hand, TVSS is a device that helps visually impaired people to find direction with the help of vibration. Jansson (2008b) reported that canes for the visually impaired people, vibrating direction finding devices (Tactile Vision Substitution System – TVSS) and other such technologies support visually impaired people in finding their way and moving independently.

Technologies and equipment, such as appropriate size chairs and tables, alternative chairs, walking devices, electric wheelchairs, white sticks, or direction finding devices etc. (Annex 1) help students to sit and move (Reed, 2004; Reed, 2007; Manning, 2008; Reed, 2009; Day, Dell and Smith, 2011; Jansson, 2008b).

Social Skills and Leisure: Students with special educational needs may struggle to adopt social skills and to make use of their leisure time. Comer (2009) states that the assistive technologies such as 1) Typical toys, puzzles, balls, utensils or instruments adapted; adjustable equipment; flexible rules; add visual/auditory clarity 2) Specially designed utensils or equipment; electronically or mechanically adapted utensils and equipment 3) Electronic aids such as remote controls, timers, CD players, and speech generating devices 4) Computer-facilitated and computer-based activities 5) Online and virtual recreational experiences 6) Electronic aids such as remote controls, timers, CD players, and speech generating devices 7) Computer-facilitated and computer-based activities and 8) Online and virtual recreational experiences can be used for the recreation and leisure skills. Generally, different assistive technologies, such as toys, computer games, or sports equipment, adapted to the needs of students with special educational needs (Annex 1), enable them to make use of their leisure time and to participate in social activities (Reed, 2004; Reed, 2007; Reed, 2009; Day, Dell and Smith, 2011).

Studies show that assistive technologies can be used to support those social skills which persons with autism disorder have difficulty in performing in daily life (Lang et al., 2014). Schmidt (2014) found in his study on the use of a 3-dimensional learning environment in teaching social skills to persons with autism spectrum disorder that the teaching objectives were achieved and that the children were able to use the social skills that they had learned in the 3-dimensional learning environment in their daily life. Tools such as audio balls, audio step counters, audio positioning devices (GPS- Global Positioning System), and audio sea voyage devices facilitate the ability of persons with visual disorders to play sports (Herhs and Johnson, 2008b). Audio descriptions of theater, television and cinema productions and other media publications enable persons with visual disorders to easily understand media publications (Hersh and Johnson, 2008b).

Daily Living: Students with special educational needs may have difficulty in daily-life functions, such as eating, cooking, dressing and shopping. Technologies such as adapted toys or sports equipment (Annex 1) can support persons with special educational needs in their daily lives (Bryant, Seok and Ok, 2012; Reed, 2007; Gierrach and Stindt, 2009; Day, Dell and Smith, 2011). For example, the assistive technologies such as 1) Simplified cookbooks such as 4 ingredient cookbook 2) Modified cookbooks (picture supported) 3) Visual or verbal directions for using heating equipment such as stove, oven, and microware 5) Visual directions to insure safety (what to do in case of spills or fire, 911 directions) and 6) Adapted timers (visual, talking, large display) can be used to support the skills required for cooking in daily life (Gierrach and Stindt (2009).

Regarding to support daily life skills; Bouck et al. (2013) showed that two mentally-disabled students benefited from the use of audio records when creating a shopping list. Herhs and Johnson (2008b) highlighted the effectiveness that tools such as adapted needles for sewing or distance measuring devices had in accommodating the daily life needs of the visually-impaired. Douglas, Wojcik and Thompson (2012) revealed that Apple's smart

phones and computers feature 280 applications that aim to support persons with mental and developmental disorders in their daily lives and suggested that the effect of these applications on learning should be investigated.

Organization: The basic competences required in the education process include organizing and remembering information, managing time well, and having work skills. Various assistive technologies, such as control charts or electronic schedules (Annex 1), can be used for those who lack proper organization and working skills (Adebisi, Limsan and Longpoe, 2015; Reed, 2004; Reed 2009; McCulloch, 2004; Day, Dell and Smith, 2011; Reed and Bowser, 2013). For example, Obukowicz, Stindt, Rozanski and Gierach (2009) recommend the use of the assistive technologies such as 1) Tabs 2) Sticky notes and index cards 3) Highlighters 4) Handheld recorders 5) Key words 6) Study guides 7) Task analysis 8) Digital highlighters and sticky-notes 9) Handheld scanners/electronic extraction 10) Electronic organizing 11) Study grid generators/grading rubric 12) Online search tools 13) Online web trackers 14) Online sorting file tools 15) Digital graphic organizers and 16) Online manipulatives, interactive, tutorials, and animations for organization and information management.

Study results Show that assistive technologies can be effective in the development of organization skills. Mechling (2005) indicated in the literature review he conducted on the use of assistive technologies that the studies on this subject found that the use of assistive technologies (pictorial, tactile or audio stimulation and computer-aided systems) resulted in the improvement of the capabilities of mentally-impaired people to initiate and complete their daily activities. Additionally, Stephenson (2015) showed in his study that the use of tablet computers had a positive effect in teaching daily routine tracking to students with special educational needs.

Computer Access: As computers provide convenience in many areas of daily life, they can be of fundamental importance for persons with special educational needs in enabling them to learn new skills and acquire information, to demonstrate what they learn in school, and to participate in class activities (Lindstrom-Drescher, 2009; Brodin and Peg, 2004; Alcade, Navarro, Marchena and Ruiz, 1998). Persons with special educational needs who struggle to use computers can benefit from the use of other technologies, such as screen reading software, adapted keyboards, and screen keyboards (Annex 1) (Coleman, 2011; Isaila, 2014; Reed, 2004; Reed, 2007; Manning, 2008; Reed, 2009).Lindstrom-Drescher (2009) states that 1) Positioning of the student and equipment 2) Standard keyboard and mouse with accessibility/access features built into the operating system 3) Standard keyboard and mouse with adaptations 4) Rate enhancement 5) Alternate keyboard and mouse 6) Onscreen keyboard 7) Voice recognition software 8) Eye gaze 9) Morse code and 10) Switch access can be used for access to computers.

Provision of students with special educational needs with access to computers can also lead to supporting the different skills of these students such as communication or writing. For example, writing skills of students who cannot use pens and papers due to physical impairment can be supported via computers. Similarly, in a project conducted in Switzerland on the use of tablets in special education schools, Karlsudd (2014) found that tablets helped students to be more active in the education process, that they offered alternative communication opportunities through audio, pictures etc., and that they provided more economic resources for learning.

Technology Implementation Models in Special Education

Analyzing the special education policies and movements of thought throughout history, medical and social models are observed to have significant effects on these policies (Kökkaya, 2006). As of 1950s and 1960s a “social model” approach has been adopted for individuals with disabilities in countries such as the USA or England (Özgökçeler and Alper, 2010).

Two basic models – the medical model and the social model –have been adopted in assistive technologies implementations. In the medical model, works are conducted on the particular disability of individuals and the effects of this disability. In the social model, the focus in on the effect of the factors of process, operations, equipment, materials, activity, and system on the easy and safe use of assistive technologies (Hersh and Johnson 2008a). The aim of assistive technologies social model is to provide individuals with disabilities with the opportunities they need in their social life. Adoption of social model in assistive technology applications leads innovations regarding the social inclusiveness of individuals with special educational needs. In addition, social model approach indicates that environmental arrangements such as schools, hospitals, healthcare centers, sports centers, bus stops, banks, etc. should be made to provide all members of community with access to education, employment, and daily life activities. The implementation models of assistive technologies within the framework of the social model show variance in the literature (Hersh and Johnson, 2008b).

Models used to determine and use the appropriate assistive technologies to be utilized in education of individuals with special educational needs. Edyburn (2001) revealed that there are twelve different model implementations on

the use of technologies in special education. Table 1 presents a summary of the models explained in Edyburn's study.

Table 1. Models of Special Education Technology

	Models	Authors
1	The SETT Framework Model	Joy Zabala, 1995
2	Education Tech Points Model	Gayl Bowser and Penny Reed, 1995
3	The Human Activity Assistive Technology- HAAT Model	Alebert M. Cook and Suzan M. Hussey, 2002
4	Wile's Model of Human Performance Technology	David Wile, 1996
5	Has technology been considered?	Antonette C. Chambers, 1997
6	The AT CoPlanner Model	Haines, Gladene Robertson, Robert Sanche et al., 1997
7	The A3 Model	Roger, O. Smith, Todd, D. Schwanke and Dave L. Edyburn, 2001
8	The ABC Model	Rena Lewis, 1993
9	King's Adaptation of Baker's Basic Ergonomic Equation- BBEE	Thomas W. King, 1986
10	Stages	Madalaine K. Pugliese, 2000
11	Edyburn's Model of the Technology Integration Process	Dave L. Edyburn,1998
12	The Quality Indicators for Assistive Technology Services Model	The QIAT Consortium, 2000

(Edyburn, 2001)

In the literature review conducted by Watt, O'Brian and Wojcik (2004), they addressed the 'Chambers' Consideration Model, Education Tech Points, SETT Framework, and Unifying Functional Model to assess the assistive technologies used in special education. Watt, O'Brian and Wojcik (2004) observed that the strengths of these models were their ability to provide students with more than one opportunity and to take into consideration the students' needs and the results obtained.

The studies on the assistive technology models in special education accessed within the scope of the present study addressed the following models, applications of which is often explained:

-Student Environment Task Tool Framework (SETT)
- Education Tech Point
- Human Activity Assistive Technology (HAAT)
- Has technology been considered?
-Quality Indicators for Assistive Technology Services

The information on the five models encountered in technology implementations in special education, according to the data obtained from the sources accessed within the present study, are summarized below.

Student Environment Task Tool Framework (SETT): In this model developed by Zabala, information is obtained on the students, environment, tasks and tools in order to make effective decisions on assistive technologies. This model aims to determine the assistive technologies for persons with disability, to monitor the common action steps to be followed in preparing curriculum, and to ensure consensus. It is recommended that the following questions be answered within the scope of this model (Zabala, 2000).

1. **Students:** What must the students do? What special needs and skills do the students have?
2. **Environment:** What are the educational and physical arrangements? Are there special issues to be considered? What materials and equipment are used within the particular educational environments? What supports are suitable for both the students and the personnel working with the students? How do the attitudes and expectations of the people around the students affect their performance?
3. **Tasks:** What are the activities that enable the students to achieve the determined objectives? What are the important elements of these activities?
4. **Tools:** Do the assistive technology tools and strategies require the students with special needs and abilities to perform certain tasks in certain environments? What kinds of assistive technologies do the

students need when performing certain tasks in certain environments? Which strategies can be used to improve the performance of the students?

In the guide prepared by Reed (2009) based on this model, it is recommended that information be obtained about the competencies, incompetencies, ages, environments (class, home etc.), health status, computer access, communication, writing, reading, mathematics, organization, making use of leisure time, the visual and hearing skills of the students, as well as the services they receive and the assistive technologies they previously used. Reed (2009) listed the questions that needed to be addressed concerning the determination of the requirements persons with special educational needs had for assistive technologies and the services to be provided as:

1. Which tasks do the students want to perform (writing, reading, communication, hearing etc.)?
2. Do the students use special strategies when performing the tasks given to them?
3. What are the assistive technologies (tools, software and equipment) used by the students?
4. Does the use of assistive technologies enable the students to show more effective performance in a minimum restricted environment and with minimum assistance?

Reed (2009) also recommended that other information be obtained, such as the people with whom the students interact, the arrangements needed in different environments, the position of the students in the class, the tools, such as whiteboards and illumination devices, required for the students, and seating arrangements, by observing the environment of the student, interviewing the teachers, and carrying out implementations and assessments according to the IEP.

The guide prepared by Manning (2008) for conducting assessments in schools or in assistive technology centers within the scope of this model includes the action steps and the forms that can be used.

Education Tech Point: This approach was designed by Bowser and Reed to guide the decision-making process for assistive technology services (Bowser and Reed, 1995). The target groups for this model are families, caregivers, and the personnel working in the fields of education and law (Reed and Bowser, 2013). Bowser and Reed (1995) presented the stages of decision-making for the assistive technologies to be used in the education process as 1) Application, 2) Assessment, 3) Trial, 4) Plan Development, 5) Implementation, 6) Periodical Monitoring and Provision of Transition. The stages recommended in this model can be used in referral, evaluation and IEP development processes. The structure of the model supports the process of providing students with assistive technology and monitoring assistive technology. Education Points questions help determine the students' needs in the institution where they continue their education. The application stages of the model include initial referral questions, evaluation questions, extended assessment questions, plan development questions, implementation questions and periodic review questions (Bowser and Reed, 1995).

Human Activity Assistive Technology (HAAT): A theoretical framework was developed in this model to define the basic factors that affect the use of assistive technologies (Hersh and Johnson, 2008b, p. 2). The model, which recommends that assistive technology services focus on increasing the individuals' performances, is defined under the titles explained below:

1. Human (Senses, processing, motor skills),
2. Activity (Performance in skill sets, such as self-care, and in certain environments, such as school or work place),
3. Assistive technology (Technological features or processes, environmental features), and
4. Context (Environment, social status, cultural status, physical status) (transferred from: Edyburn, 2001).

Determination process of the assistive technologies based on this model generally includes four components and the interaction between them (Edyburn, 2005). Power Dirette (2014) proclaimed that this model, which is commonly used throughout Western Europe, established the basic concepts of development of technology and assessment of the effect of technological tools.

Has technology been considered?: In this model developed by Chambers (1997), the aim is to guide the decision-making process for assistive technologies according to the students' needs. Chambers (1997)recommends the IEP team ask the following questions during the decision-making process on the appropriate assistive technology for the students:

1. What do we want the students to do within the curriculum?
2. In which educational tasks (reading, writing, listening, mathematics, movement, sitting, seeing, self-care etc.) are the students unable to participate?
3. Will assistive technologies be able to support the achievement of these objectives?

4. What has been done to meet the needs for special education?
5. Do we as a team have adequate knowledge on the issues, such as assistive technology tools and/or services?
6. Under which conditions and criteria, in which environment, and for how long should the implementations be performed?
7. What has happened in the environment, technology and the process?

Based on Chambers (1997) model, the guide prepared by Wojcik and Douglas (2012) on the decision making process for the assistive technologies to be used by the students recommends that the IEP Team;

1. Analyze the academic skills, functional skills and existing assessment data of the students,
2. Determine annual objectives, including targets and criteria,
3. Determine whether or not the students can achieve the determined objectives without assistive technologies,
4. Determine whether or not the IEP team has the knowledge required for making a decision,
5. Determine the support, adaptation or arrangements that the students need,
6. Collect more information or consult an expert about the area that shall be needed for the team,
7. Determine whether or not the students already use this assistive technology, and if so, how well are they able to use it.
8. Define the required supports, services and assistive technologies to best enable the students to participate and succeed in education, and follow the action steps.

Wojcik and Douglas (2012) stated that the most important factor in the education process is the effective use of the assistive technologies in supporting the students' functional skills, such as reading, communication, movement, etc. They also expressed that the students' educational performance should be supported, being sure to take into consideration that assistive technology is not specific to one certain group of disability or one certain skill. They recommended to first use the low-cost and easy-to-use low technologies, and then move on to considering the high technologies when making a decision on the assistive technologies to be used in the education process.

Quality Indicators for Assistive Technology Services: In the USA, although relevant legislation (IDEA'97) includes provisions for the use of assistive technologies, no standard definition exists for the quality of the assistive technology services. The Quality Indicators of Assistive Technology (QIAT) Consortium prepared indicators to assess the quality of assistive technologies in 2000. These indicators are: 1) Administrative Support, 2) Consideration of Assistive Technology Needs, 3) Assessment of Assistive Technology Needs, 4) Documentation in the IEP, 5) Assistive Technology Implementation, and 6) Evaluation of Effectiveness (Edyburn, 2001).

The quality indicators for assistive technologies updated by the said institution included the phased indicators for 1) Consideration of Assistive Technology Needs 2) Assessment of Assistive Technology Needs 3) Including Assistive Technology in the IEP 4) Assistive Technology Implementation 5) Evaluation of the Effectiveness of Assistive Technology 6) Assistive Technology Transition 7) Administrative Support of Assistive Technology Services and 8) Professional Development and Training in Assistive Technology, as well as common errors that may be encountered (QIAT, 2012. The guide prepared by the Minnesota Department of Children, Families and Learning (2003) for the assistive technology services emphasizes that the quality indicators for assistive technologies were based on the provision of cooperation among the team members as well as the legal requirements and the fulfillment of the responsibilities by the team members. The general aim of this model is to support the process of developing and evaluating the assistive technology services for students with disabilities (Zabala, 2007).

Lahm and Mendonca (2008) reported that a large number of tools are used during the process of assistive technologies assessment, and determined from their literature review that 47 formal and informal assessment tools can be used in schools. Lahm and Mendonca (2008) categorized the assessment tools for assistive technologies under 1) Identification/Interference 2) Determination of Satisfaction 3) Determination of the Results and 4) Research Objective. Table 2 shows the 8 assessment tools specified by Lahm and Mendonca (2008) which are used in the assessment of the assistive technologies for persons with special educational needs.

Table 2. Assistive Technology Assessments Tools	
Categories	
Diagnostic/ Intervention	1. Assessing Student Needs for Assistive Technology (ASNAT) (4th edition) 2. Education Tech Points: A Framework for Assistive Technology Planning 3. Functional Evaluation for Assistive Technology (FEAT) 4. Matching AT & Child- MATCH 5. Matching Persons with Technology - MPT 6. University of Kentucky Assistive Technology (UKAT) Toolkit)
Satisfaction	1. Quebec Evaluation of Satisfaction with Assistive Technology - QUEST-Version 2.0)
Outcomes/ Research	1. Psychosocial Impact of Assistive Devices Scale (PIADS) (Version 4.2)
(Lahm and Mendonca, 2008)	

In addition, the assistive technology assessment tools analyzed by Lahmm and Mendonca (2008) include:

- *Screening tools providing a quick look at an individual for deficits that may be addressed with assistive technology and suggest a further assessment if needed,*
- *Implementation instruments going beyond the identification of a device and providing practical suggestions for implementing AT and concrete measurements that can be used to demonstrate progress toward the goals,*
- *Follow-up instruments that plan for periodic check-ups similar to the implementation instruments.*
- *Impact instruments document changes in human performance and the system as a whole that contribute to task performance (p.3).*

Besides, the purposes that have the fewest instruments available are referral, matching person to technology, acquisition, and outcomes.

DISCUSSION AND CONSLUSION

Students with unique characteristics and needs should be provided with equal learning opportunities in the education process. Providing access to the appropriate assistive technologies and supporting their education are among the fundamental factors in creating equal education opportunities for persons with special educational needs. This study aimed to present the current implementations found in the literature on the use of assistive technologies during the education of persons with special educational needs.

Technologies that serve to improve the students' quality of life in a manner appropriate to their individual differences and needs can be used to support persons with special educational needs in many areas of education. The results of the studies analyzed for the present research show that assistive technologies are used for supporting persons with special educational needs in numerous areas, such as reading, writing, communication, daily life, etc. Further, the studies in the literature indicate that the use of assistive technologies in education has positive effects. As seen from the literature review conducted, the nature of the studies (software, features of the devices, etc.) have changed over time, with various assistive technologies being recommended for different disability groups (Chambers, 1997; Reed, 2004; Reed, 2007; Manning, 2008, Reed, 2009; Day, Dell and Smith, 2011, Jansson, 2008b)

Studies in the literature show that assistive technologies can be used to support the education of students with different impairments such as physical, visual and hearing incompetence or learning disability and application of these technologies generally results in positive. McKnight and Davies (2012) indicated in their literature review that more focus has been put on some disability groups than the others. The present study also includes a lower number of studies on people with hearing and physical disabilities.

Special educational needs of the individuals show difference in the education process. Professionals and researchers working in the area of special education should understand the needs and capacities of the students to provide them with the most appropriate support. (McKnight and Davies, 2012). In this regard, models have been developed to enable students with special needs to benefit from the appropriate assistive technologies in education process. The literature shows that different models have been developed for the use of technology and that five models in particular are more frequently used (Reed, 2007; Reed, 2009; Day, Dell and Smith, 2011; Watt, O'Brian and Wojcik, 2004). Study results show that the models applied in this area allow the determination of the needs of students with special educational needs for assistive technology according to their individual needs. Provision of

the opportunity to individually evaluate students facilitates the integration of them into the education life in line with their needs. In addition, assistive technology assessment tools have common purposes at the screening, implementation, follow-up and referral stages (Lahm and Mendonca, 2008).

Increasing knowledge and experience of the professionals in this field will lead to an increase in educational opportunities for students with special educational needs. Development of appropriate assessment tools for assistive technologies will facilitate the access to appropriate assistive technologies and inclusion in social life and education of students with educational needs. Teachers can have difficulty in providing equipment, determining the appropriate learning materials, and using different teaching methods according to the learning needs of their students (Williams, 2005; Bell, Cihak and Judge, 2010; Petçu, Yell and Fletcher, 2014). Stoner et al. (2008) indicated in their study that teachers have difficulty in determining their students' needs, identifying and using the assistive technologies used in the literature, and allocating adequate time for the use of assistive technologies in pre-school period. In addition, Williams (2005) emphasized that teachers working in the field of special education need guides that include sample practices for teaching process, guide applications and technical support.

Significant contributions can be made to the body of literature related to this field by conducting studies on the needs of students, teachers, parents, and administrators for assistive technologies in special education, on the assessment of the existing needs and how to meet them, and on the assessment of the assistive technology implementations. McKnight and Davies (2012) recommended in their study on the education process that the following be taken into consideration: a) the needs and capabilities of the students, b) the capacity of technology, and c) the educational environments. The number of those who can benefit from this literature review will significantly increase if the results of the studies on assistive technologies are shared in congresses and symposiums as well as on a common website. Moreover, it is important that pre-service teachers trained in special education and studying in undergraduate and graduate education programs be provided with the information and skills on assistive technologies and on the use of computers.

Assessment of assistive technologies, preparation of appropriate assessment tools for training the teachers in line with the appropriate model, preparation of guide materials, provision of teacher trainings, and sharing up-to-date sample implementations based on the current assistive technologies and implementation models will help these implementations become widespread as well as being effective and efficient. Cooperation between special education professionals, therapists, social workers, funding bodies, engineering communities and other researchers as well as creating an effective model framework for assistive technology implementations preparing assessment instruments and guide resources for determination of then needs for assistive technologies, and sharing the current practices are important in this field.

This literature review regarding the assistive technologies and models implemented in special education is considered as the first stage. It will be helpful that the themes in the present study be respectively analyzed in the future studies and studies be conducted on the effects of the existing models for the use of assistive technologies in education and on the development of models. In addition, researchers should analyze the tools and indicators regarding the assessment process of assistive technologies.

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Annex 1: A Sample List of Assistive Technology for Persons with Special Educational Needs	
Communication	
❒Communication board/book with pictures ❒Eye gaze board/frame ❒ Simple speech generating device ❒ Speech generating device with levels ❒ Speech generating device with icon sequencing	❒Speech generating device with dynamic display ❒ Text-based device with speech synthesis ❒Picture Exchange Communication System PECS ❒Smart phones
Reading	
❒ Adapted books for access e.g. page separators ❒ Modified text: size, color, spacing ❒ Enlarged print text ❒ Braille printed materials ❒Audio books, MP3 player ❒ Tape recorder ❒Picture symbol supported text ❒Tracking aids, e.g. Reading windows ❒Magnifier ❒Electronic magnifier	❒Talking electronic dictionaries ❒Digital e-Readers ❒ Word scanners ❒ Digital books with text highlighted as read ❒ Text-to-Speech ❒ Digital books with adapted text ❒ Closed circuit television-CCTVs ❒ Screen reader ❒ Optical Character Recognition (OCR) ❒ Microsoft Word
Writing	
❒ Environmental and seating adaptations ❒ Variety of pens/pencils ❒ Adapted pen/pencil ❒ Pencil or pen with adaptive grip ❒ Adapted paper, e.g., raised line, highlighted lines ❒ Slantboard to create slanted writing surface ❒ Writing templates ❒ Picture Supports to write from/about ❒ Word cards/Word banks/Word wall ❒ Pocket dictionary/Thesaurus ❒ High contrast pen ❒ Portable, talking spellcheckers/dictionary/thesaurus ❒ Portable word processing device ❒ Alternative keyboards ❒ Computer with scanner ❒ Proofreading	❒ Word processing with spell checker ❒ Voice recognition software ❒ Computer with voice recognition software ❒ Word prediction software ❒ Word processing with digital supports ❒ Talking word processing ❒ Tools for citations and formats ❒ Typing with audio support ❒ Tape or digital recording device ❒ Braillewriter ❒ Slate and stylus ❒ Typing with Braille support ❒ Computer-based recording software ❒ Braille keyboard ❒ Electronic Braille note taker
Mathematics	
❒ Abacus ❒ Enlarged math worksheets ❒ Tactile/audio graphics ❒ Voice recognition software ❒ Calculator ❒ On-screen/scanning calculator ❒ Money calculator	❒ Talking watches/clocks ❒ Talking calculator ❒ Models, 2D, 3D geometric shapes ❒ Tactile measuring devices ❒ Braille Monitor ❒ Alternative keyboard ❒ Electronic Mathematics Worksheets
Vision	
❒ Eyeglasses ❒ Magnifier ❒ Large print ❒ Embossed pictures ❒ Embossed maps	❒ Screen magnification software ❒ Screen color contrast ❒ Screen reader, text reader ❒ Braille translation software ❒ Closed circuit television, CCTV
Hearing	
❒ Pen and paper ❒ Computer/portable word processor ❒ TDD/TTY for phone access with or without relay ❒ Signaling device e.g., flashing light or vibrating pager ❒ Closed Captioning ❒ Real-time captioning	❒ Flash for alert signals on computer ❒ Phone amplifier ❒ Personal amplification system/Hearing aid ❒ FM or loop system ❒ Infrared ❒1:1 Communicators ❒ Computer-aided note taking

<table>
<tr><td colspan="2">Positioning, Seating and Mobility</td></tr>
<tr><td>❒ Standard seat/workstation at correct height and depth
❒ Standard seat correct height and depth
❒ Nonslip surface on standard seat to prevent slipping
❒ Modifications to standard seat or desk
❒ Alternative chairs</td><td>❒ Grab bars and rails
❒ Manual wheelchair
❒ Powered wheelchair joystick or other control
❒ Powered toy car
❒ Adapted vehicle for driving</td></tr>
<tr><td>❒ Adapted/alternate chair, sidelyer, stander
❒ Custom fitted wheelchair
❒ Walking devices/walker</td><td>❒ Cane
❒ Tactile Vision Substitution System- TVSS
❒ Global positioning system GPS</td></tr>
<tr><td colspan="2">Social Skills and Leisure</td></tr>
<tr><td>❒ Adapted toys
❒ Adapted sporting equipment
❒ Modified rubber stamp, rollers, brushes
❒ Arm support for drawing/ Painting</td><td>❒ Software to complete art activities
❒ Games on the computer
❒ Other computer software
❒ Electronic aid to control/ operate TV, CD player</td></tr>
<tr><td colspan="2">Daily Living</td></tr>
<tr><td>❒ Universal cuff/strap to hold items in hand
❒ Color coded items for easier locating and identifying
❒ Adaptive eating devices
❒ Adaptive drinking devices
❒ Light switch extension
❒ Radio/ultra sound to remotely control appliances
❒ Adaptive bathing devices</td><td>❒ Adaptive equipment for cooking
❒ Adaptive driving equipment
❒ Adapted toothbrushes, raised toilet seat
❒ Adaptive dressing devices
❒ Adaptive sewing devices
❒Interface and switch to turn on electric appliance</td></tr>
<tr><td colspan="2">Organization</td></tr>
<tr><td>Information Management
❒ Tabs
❒ Sticky notes, index cards
❒ Highlighters
❒ Key words
❒ Study guide
❒ Task analysis
❒ Digital highlighters
❒ Handheld scanners
❒ Electronic organization
❒ Online search tools
❒ Online web trackers
❒ Online sorting file tools
❒ Digital graphic organizers
❒ Online manipulatives, interactive, tutorials, animations
❒ Recorded material, e.g., books on tape, taped lectures)
❒ Prewriting organizers</td><td>Time Management
❒ Checklists
❒ Schedules- visual
❒ Portable, adapted timekeepers
❒ Electronic reminders
❒ Digital planners (PDAs), cell phones
❒ Web-based planning tools
Material Management
❒ Checklists
❒ Container system
❒ Coding system
❒ Electronic filing and storage
❒ Portable electronic storage
❒ Computer-based tools
Self-Management
❒ Sensory regulation tools, e.g. Sunglasses
❒ Movement and deep pressure tools
❒ Fidgets
❒ Auditory reminders
❒ Visual reminders
❒ Electronic reminders</td></tr>
<tr><td colspan="2">Computer Access</td></tr>
</table>

❒ Positioning of student ❒ Arm support ❒ Standard keyboard/mouse with accessibility/access features built into the operating system ❒ Standard keyboard/mouse with adaptations ❒ Alternate keyboards ❒ Alternate keyboard/mouse ❒ Onscreen keyboard ❒ Voice recognition software ❒ Eye Gaze ❒ Morse Code	❒ Switch Access ❒ Color scheme ❒ Large operating system features ❒Built-in magnification ❒ Fully-featured magnification ❒ Magnification with screen reader ❒ Screen reader ❒ Screen reader with Braille device ❒Keyguard ❒Enlarged or Braille/tactile labels for keyboard ❒ Alternate keyboard with enlarged keys ❒ Braille keyboard

Students' Perceptions of E-Assessment at Saudi Electronic University

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ABSTRACT
This study explored students' perceptions of E-assessment at Saudi Electronic University. The university recently implemented this mode of assessment in the learning management system it uses. Therefore it is importance to examine the students' perceptions of this mode at the university level. The results were encouraging. Students had positive perceptions of e-assessment and valued its features such as immediate feedback and unbiased grading.

INTRODUCTION
Assessment is a core element in the educational system to obtain information about the extent the learning outcome has reached. Valid and reliable assessment improves the quality of learning, teaching and academic programs (Dermo, 2009, Rastgoo, Namvar, & Iran, 2010) and is important for learners, teachers, and educational institutions. Students need to know whether they are approaching the goals set up for them. Confirming students' knowledge is the educational organization's task (Rowe, 2004), which cannot be done without assessment which validates that the students have learned. Students learn better when they know the learning objectives and the criteria used to measure achievement of these objectives.

Educators, too, need to know whether they are using appropriate teaching methods and approaches. One goal of assessment is to direct the instructor to the students' needs to improve the learning process (Rocco, 2007). Institutions need to provide evidence that they are doing what they are supposed to do. Not only students and their parents but other parties in society, such as benefactors, educational policy makers, and companies that offer jobs to graduates of these institutions, want to see this evidence. "If an institution claims to provide a service, they must prove to society that they do by some assessment mechanism" (Rowe, 2004, p. 2).

With increasing interest in e-learning and e-assessment, with more institutions providing it and more students taking it, consideration should be given to students' opinions about e-assessment. Without knowing their opinions, it hard to offer e-assessment which will be a primary mode of assessment at Saudi Electronic University. E-assessment in this study refers to the use of technology to assess students' learning.

LITERATURE
Student Role in E-assessment
Although the practice of assessment is different in online and face-to-face environments, "the principles of assessment do not change in an online environment" (Benson, 2003, p. 71). Ronles and Braathen (2002) described the change that occurs when moving to online learning: In the online environment, the student is responsible for his or her learning. He or she, for example, is required to read, understand, ask, answer, discuss, and explore the learning materials provided by the instructor. The instructor, as Ronles and Braathen stated, facilitates all these activities, and encourages communication and interaction among students and aids students in engaging with the technology. Chat rooms and email should compensate for the absence of a warm body providing the guidance that keeps students from getting lost in the online world (Ronles & Braathen).

Liang and Creasy (2004) stated that the assessment methods used in an online environment should reflect the nature of the online learning that gives the learner more responsibility for his or her learning. It should be designed in a way that allows students to demonstrate their capability in solving real-life problems, and should reflect aspects that have changed from traditional teaching, such as self-directed learner (or learner autonomy), teacher as facilitator of learning, and writing communication.

Through the traditional assessment lens, on the other hand, the learner as the recipient of knowledge and learning is assessed by measuring recall of facts and comprehension skills (Robles & Braathen, 2002) which does not allow the higher levels to take place. Haken (2006) stated that assessing students' knowledge is important but not

sufficient. The students' ability to transform learning from memorizing facts to a wide model that reveals the academic programs outcome is more important (Buzzetto-More & Alade, 2006).

The constructivism approach adopted by educators enables students to produce their learning. This approach can be applied where some of the assessment responsibility is taken from the teacher and given to the learners (McLoughlin & Luca, 2001). Thus, learners become responsible not only for building their knowledge and learning but also for assessing that learning by being involved in the assessment activities and receiving feedback. The e-assessment supports such an approach that is appropriate for this generation of learners who want to participate in making the decisions of their learning experience (Prensky, 2005). Students' perception of assessment has also changed and they now see assessment as part of their learning, which can be practiced by themselves or their peers (Rastgoo et al., 2010).

Educator Role in E-assessment

In order to achieve a meaningful assessment, educators should predetermine the purpose of the assessment, its desired outcome and the criteria to be measured (Gaytan & McEwen, 2007). Informing the students about the objective of the course helps them to learn better. Educators also should modify their teaching methods in order to provide assessments that match the level of desired goals (Liang & Creasy, 2004). Online educators should adopt assessment methods that allow their students to demonstrate achievement of the course objectives (Ronles & Braathen, 2002). Because teaching methods changed when the institution moved to an online environment, different assessment methods should be adopted as well (Liang & Creasy. 2004). Instructors are now changing their perceptions and perceived projects, weekly assignments, self-assessment, portfolios, timed quizzes, and discussion boards as effective assessment methods (Gaytan & McEwen, 2007).

Advantages of E-assessment

The use of e-assessment brought many advantages for students, educators and educational institutions. For example, e-assessment allows for evaluating important life-skills, for improving the reliability of scoring and accordingly improving the quality of the test itself, and helps to avoid the drawbacks of the traditional paper-based assessment system - such as the time required for grading (Ridgway, McCusker & Pead, 2004). E-assessment also motivates students to participate, giving feedback to a large number of students, saving marking time (Dermo, 2009), provides high quality data for teachers and administrators (Hoover, 2007), as well as reducing the printing cost (Rastgoo et al., 2010). E-assessment increases objectivity in grading because the computer grades the exams regardless of students' names, race, culture, etc. (Ozden, Erturk & Sanli, 2004). For students, e-assessment's advantages are: It is flexible in terms of time and place and provides immediate feedback (Hoover, 2007) which fosters self-assessment for students (Sorensen, 2013). E-assessment enables personalized evaluation, is low cost, motivates students to learn, encourages skills practicing (Ozden et al., 2004), and provides students with a chance to participate in problem-solving that promotes deep learning (Sorensen, 2013) E-assessment aggregates students' scores, enabling educators to see their students' learning progress and facilitating immediately available management of data (Hamilton & Shoen, 2005).

Disadvantages of E-assessment

Despite its many advantages, e-assessment has some disadvantages that might hinder its use. For example, e-assessment is time-consuming in terms of preparing tests, requires technology, and lacks control of tests (Rastgoo et al., 2010). E-assessments give the instructors less control over the exam setting, which makes cheating easier for students. Rowe (2004), in his exploratory study to reveal problems of dishonesty in online exams, discussed the three most serious problems in online assessment. First, students can have answers to the exam prior to taking it. As it is hard to ensure that all students are taking the exam at the same time, so students who take the exam first can give other students the questions.

The second problem that Rowe (2004) mentioned was that students can retake the assessment many times, giving them time to review the questions and respond correctly. Rowe discussed different ways that students can manipulate their instructors into providing them with another chance to take the exam such as crashing the server or breaking the power, then claiming that they lost their answers. Students might even change the system clock to tricking the system into treating them as new exam takers.

The third problem discussed by Rowe (2004) was illegal help during the exam, such as exchanging emails or hiring someone else to take the exam. As Rowe stated, students know computers better than their teachers do so it is easy for them to use computers for cheating. Therefore, security should be a concern for instructors in e-assessment. Perrin and Mayhew (2000) for example, found that the assessment items were printed and shared

among students. Restrictions on assessment, such as blocking students from viewing the questions after submitting the answers or limiting the time to ensure that all students are taking the test at the same time, will restrict the effectiveness of the test as an assessment tool (Ronles & Braathen, 2002).

Some literature suggests that online instructors have the option of combining e-exams with traditional exams to avoid the problem of dishonesty in e-assessment. Rowe (2004) criticized this combination, saying it reduces cheating but does not eliminate online cheating. Furthermore, some students can be nervous in the traditional setting and so do better in online testing. Bork (2001) suggested that educators use ongoing tests so cheating won't be cost effective for students. However, this tactic requires significant work, prevents students from studying at their own pace, implies that they are not trusted to learn without testing, and focuses on short-term learning (Rowe, 2004).

Using a pool of questions where each student gets different, randomly selected questions was another suggestion for overcoming the problem of dishonesty in e-assessment. However, this solution requires time and effort to generate a pool of questions, and will not ensure that each student gets different questions because there will always be overlapping.

Related Work

Dermo (2009) conducted a study to examine the perceptions of students toward e-assessment. Dermo focused especially on the following aspects of e-assessment: effectiveness, validity, security, practically, reliability, and pedagogy. Dermo found that students hold positive feelings in general and are concerned only about the unfairness of question banking where each student has different questions. Despite the fact that educators can use validity evidence techniques to make question banking relatively fair, students in Dermo's study believed this method would not ensure that all students were exposed to the same level of difficulty.

Rudland, Schwartz and Ali (2011) directed a study to determine the acceptability to students of the computer-based exam. The students in their study accepted that format of testing and thought the flexibility and convenience of taking the exam anywhere and anytime, coupled with immediate feedback, were the most important benefits of such form. However, they considered the possibility of cheating as problematic.

Sorensen (2013) conducted a study to investigate the students' perception of e-assessment. He found that students were engaged in the e-assessment process and believed that it added value to their learning.

Hassanien, Al-Hayani, Abu-Kamer, and Almazrooa (2013) surveyed students to collect information about their perceptions of computer-based assessment as a summative assessment. They found that students were highly satisfied and believed that the advantages outweighed the disadvantages

Jawaid, Moosa, Jaleel and Ashraf (2014) also conducted a study to investigate the students' perceptions of computer-based assessment. They found that students have a good attitude toward computer-based assessment and valued features such as the use of multimedia, the automatic grading, and the personalized feedback.

Bandele, Oluwatayo, and Omodara (2015) investigated university undergraduates' opinions on the use of electronic examination. They found students favored the use of e-examinations. They also found significant variations in opinions across gender in favor of females.

Gotlib, Panczyk, Gębsk, Zarzeka, Iwanow, Dąbrowski, and Malczyk (2015) compared the opinions of students who participated in the electronic examinations with students who had not. They found that participation in e-examinations has no impact on the students' perceptions of them.

Chia (2016) investigated the students and teachers' perception toward the implementation of information technologies to facilitate the summative assessment. The study found that students as well as teachers hold positive attitude toward the use of technologies in assessment and they preferred it to the traditional form of assessment.

Petrisor, Marusteri, Simpalean, Carasca and Ghiga (2016) examined the students' acceptance of online evaluation system. They found that students preferred the online evaluation system over the paper and pencil examination. Participants in their study believed that online assessment can assess the knowledge level of learning and their objectives in term of grading.

THE PURPPOSE OF THE STUDY

The study aims to investigate students' perceptions of e-assessment. It seeks to answer the following questions:

1. What are the students' perceptions of the use of e-assessment used at the Saudi Electronic University
2. Does participation in e-assessment influence students' perceptions of e-assessment?

METHODOLOGY

Research Design

This is an exploratory study meant to reveal the Saudi Electronic University students' perceptions of e-assessment.

Sample

Only undergraduate students from Saudi Electronic University who had experienced online assessment were considered to be potential participants for this study. By the academic year 2015-2016, around 80 students from the university had experienced e-assessment because it was implemented only recently. The online survey was sent to all 80 students by email. Only 44 responded, which made a response rate =55%.

Instrument and data collection

Data were collected by a self-designed online survey. The survey contained 15 items to collect information about the students' opinions of e-assessment. Each item was rated on a four-point scale: strongly agree= 4 to strongly disagree = 1 and there was one item to collect information about how many e-assessments a student had experienced. That had two options: 1= 3 times or fewer, 2= more than 3.

Validity and reliability

Validity was ensured by obtaining feedback from experts from the evaluation and measurement department of the university. The instrument was modified according to their suggestions. The instrument was then piloted with 20 students from another institution to ensure its clarity and reliability.

RESULTS

Collected data were analyzed using means, standard deviation and independent t-test. Cronbach alpha was calculated and was = .91 which was a high value.

Question 1:

To answer the first question, what are the students' perceptions toward the use of e-assessment utilized at the Saudi Electronic University, means and standard deviation were used as presented in Table 1. The assumption of Bandele et al. (2015) was used for analysis: means 1.00 – 1.49 (very unfavorable), 1.50-2.49 (unfavorable), 2.50-3.49 (favorable) and 3.50- 4.00 (very favorable).

Almost all items ranged from favorable to very favorable for the participants. Immediate feedback gained the highest mean, followed by t unbiased grading. The only item that fell into the unfavorable category was "Online assessment is appropriate for all subjects".

Question 2:

To answer the second questions: Does participation in e-assessment influence students' perceptions of e-assessment? An independent t-test was performed to compare the perceptions of students who have practiced the e-assessment fewer than three times with those who had it more often. The result showed no statistically significant difference between the two groups $t(42) = .01$, $p > 0.5$. This indicated that the number of times a student practiced the e-assessment had no impact on the student's perception.

DISCUSSION

The study investigated the students' perceptions of e-assessment. The results show that the advantage of e-assessment revealed by the literature has also gained favor with Saudi Electronic University students who participated in this study. They appreciated the immediate feedback, unbiased grading, enhanced self-learning, etc. Participants favored using e-assessment as the mean scores ranged from 2.3 to 3.8. This result paralleled with other studies that found that undergraduate students favored the use of e-exam, preferring its use over the traditional exam, and holding positive feelings in general toward the e-assessment (Dermo ,2009; Rudland, et al. , 2011; Alabi et al., 2012; Sorensen, 2013; Hassanien et al., 2013; Jawaid et al. , 2014; Bandele, et al. 2015)

The highest mean was for the item: "Online assessment gives me immediate feedback about my performance" which has been shown to be an important advantage of the e-assessment, garnering 100% agreement from the students (Ridgway et al., 2004; Hoover, 2007; Dermo, 2009; Sorensen, 2013). The second item that gained a high mean was "Online assessment provides a chance of unbiased grading" which had also been found to be an advantage for e-assessment (Ridgway et al., 2004; Ozden et al., 2004). Participants in this study believed that the e-assessment does not require any advance skills nor does it facilitate cheating.

The results showed that participation in e-assessment has no impact on the students' perceptions of e-assessment which is consistent with Gotlib et al. (2015) finding.

CONCLUSION

This study aimed to explore the attitude toward the use of e-assessment of undergraduate Saudi Electronic University students. Results revealed that they hold a positive attitude, valued the immediate feedback and believed that this would benefit their learning. They also valued that e- assessment reduced bias in grading exams. From the participants' point of view, e-assessment does not require any advance skills nor does it facilitate cheating.

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Table 1: Frequencies, means and standard deviations for the survey items.

	Items	Strongly agree	Agree	Disagree	Strongly disagree	Mean	SD	
1	Online assessment enhances quality aspect of my learning	25 56.8%	14 31.8%	2 4.5%	3 6.8%	3.4	0.87	Favorable
2	Online assessment gives me immediate feedback about my performance	35 79.5%	9 20.5%	0	0	3.8	0.58	Very favorable
3	Online assessment provides faculty with feedback to improve learning	27 61.4%	11 25%	6 13.7%	0	3.5	0.79	Very favorable
4	Online assessment provides a unbiased grading	30 68.2%	13 29.5%	1 2.3%	0	3.6	0.65	Very favorable
5	Online assessment helps in improving the quality of assessment in higher education	20 45.5%	20 45.5%	3 6.8%	1 2.3%	3.3	0.71	Favorable
6	Online assessment enhances self-learning	26 59.1%	12 27.3%	4 9.1%	2 4.5%	3.4	0.84	Favorable
7	Online assessment reduces exam stress	27 61.4%	9 20.5%	6 13.6%	2 4.5%	3.4	0.89	Favorable
8	Online assessment improves my technical skills	25 56.8%	12 27.3%	6 13.6%	1 2.3%	3.4	0.81	Favorable
9	I prefer online assessment rather than the traditional one	29 65.9%	6 13.6%	5 11.3%	4 9.1%	3.4	1.01	Favorable
10	Online assessment is appropriate for all subjects	9 20.5%	9 20.5%	14 31.8%	12 27.3%	2.3	1.1	Unfavorable
11	Online assessment is appropriate for all students	10 22.7%	13 29.5%	10 22.7%	11 25%	2.5	1.0	Favorable
12	Online assessment does not require	13 29.5%	18 40.9%	6 13.6%	7 15.9%	2.8	1.0	Favorable

	advance technical skills from students							
13	Online assessment promotes applying a variety of questions	12 27.3%	15 34.1%	9 20.5%	8 18.2%	2.7	1.0	Favorable
14	Online assessment does not facilitate cheating	21 47.7%	15 34.1%	2 4.5%	6 13.6%	3.2	1.0	Favorable
15	Reading from a screen does not make using online assessment difficult	14 31.8%	17 38.6%	5 11.4%	8 18.2%	2.8	1.1	Favorable

Teachers' Attitudes toward Mobile Learning in Korea

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ABSTRACT
Mobile devices have become ubiquitous, and their uses are various. In schools, many discussions about mobile devices are ongoing as more and more teachers are adopting the technology for use in their classrooms. Teachers' attitudes toward mobile learning takes an important role in initiating its usage in schools. This study aims to investigate the attitudes toward mobile learning among Korean teachers. The authors' primary focus lies on the teachers' attitudes toward mobile learning in view of their differences in gender, school level, teaching experience, and subjects taught. In order to find out teachers' attitudes toward mobile learning, the Mobile Learning Perception Scale (MLPS) developed by Uzunboylu and Özdamlı was utilized. The results of this study showed Korean teachers' mobile learning attitudes was low in general. Female teachers were more positive than male teachers in their attitudes. Secondary school teachers' attitudes on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA&TSAC) was significantly higher than elementary school teachers. The group with more than 15 years of teaching experience showed higher attitudes toward mobile learning than those groups that were less experienced. Language teachers showed higher attitudes toward FMA&TSAC domain than all other subjects' teachers.

Keywords: mobile learning, teachers' awareness, teachers' attitude, learning through mobile devices

INTRODUCTION
With the rapid development of the technology as well as advances in electronic learning technologies, mobile learning has begun to occupy a great part of our lives. Accordingly, use of mobile devices in teaching and learning expands. Recently, various mobile devices are easy to find in schools. However, the use of mobile devices in teaching and learning raises an ongoing debate on the concept of mobile learning. Mobile learning can be defined as a type of learning where mobile devices, such as cell phones, smart phones and tablets are being used as teaching and learning tools. One of its characteristics is that mobile learning can be used independently of place and time (Bal & Arıcı, 2011).

Teachers and educators are trying to adopt it into the classrooms. Mobile devices such as laptops, personal digital assistants, and mobile phones have become a learning tool with great potential in both classrooms and outdoor learning (Sung, Chang & Liu, 2016). Mobile devices are used in a variety of teaching and learning environments. For example, mobile devices can be used to access learning materials. Gikas and Grant (2013) did their study about mobile computing devices in higher education and concluded that mobile devices are efficient tools for learners to access content and communicate with classmates and instructors, no matter where they are. They found students themselves communicating more because of the mobile devices. A second example could be that mobile devices are used to deliver learning materials to students. Ally and Stauffer (2008) conducted a study where students had the option of accessing their course materials from anywhere and at any time using their mobile devices. Their results indicated that the majority of students felt that the use of the mobile device to access the course materials was useful and provided both flexibility and convenience. A third example of usage could be that mobile devices are in use to communicate with other students, Edirisingha, Rizzi, Nie and Rothwell (2007) did a study focused on the benefits of integrating podcasts into a first year unergraduate module on English Language and Communication at Kingston University. In their study, podcast was one type of mobile

device through which students could gain experience of peers conveyed in online discussions.

As in other instructional media, teachers play an important role in mobile learning. Teachers can be a presenter, moderator, and/or consultant. In order to respond to the learners' changed role and responsibility toward their own learning, the role of the teacher as a consultant cannot be emphasized too much. In this role, teachers need to be able to identify the learners' interests, relate these interests to topic related learning goals, and offer opportunities to reach these goals that are related to the specific conditions of a learner. As mobile technology is about to be used more widely, teachers' attitudes toward mobile devices could be a driving factor to facilitate their use in schools. However, in order to make mobile learning happen on a large scale we need to revisit and address how many teachers are trying to perform their primary role as a consultant.

This study's aims are to determine teachers' attitudes toward mobile devices and to find out whether their attitudes toward mobile learning differs or not in terms of their gender, school level, teaching experience and subjects they are teaching. This study will provide answers to the following questions.

- What are the attitudes toward mobile learning among Korean teachers?
- Do their attitudes toward mobile learning differ significantly according to their gender?
- Do their attitudes toward mobile learning differ significantly according to the school levels they are teaching at?
- Do their attitudes toward mobile learning differ significantly according to their levels of teaching experience?
- Do their attitudes toward mobile learning differ significantly according to their school levels?

REVIEW OF PREVIOUS STUDIES

There have been studies on teachers' attitudes toward mobile learning in many countries. In Turkey, Serin (2012) analyzed mobile learning attitudes and mobile learning levels of the prospective teachers at a university in the Turkish Republic of Northern Cyprus according to their departments and gender. The study showed no significant difference according to the respondents' department and gender. They, prospective teachers, were less positive towards mobile learning. In another study, Nawi et al. (2015) investigated the attitudes of the religious teachers' readiness to use mobile phones in their classrooms. They investigated the types of handset used, the use of mobile applications, mobile learning activities, and the acceptance of mobile phones in teaching and learning. According to this study, the religious teachers were exposed to learning activities using mobile phones and had positive attitudes toward the use of mobile phones as learning tools. The positive attitude toward mobile learning was reported also by Güleroğlu's (2015). In this study, student teachers showed positive opinions on game based learning and on the integration of educational mobile games into teaching. Student teachers, as this study revealed, expressed willingness to integrate mobile games in their future profession. According to the researcher, this willingness is reported as a result of the main enablers which were the benefits of using or creating a game, the game being accessible and easy to use, teacher's personal interest and game based learning knowledge of teacher. However, an unprepared learning environment and technology, absence of teachers' qualifications and negative beliefs toward technology, content inappropriateness for game implementation, and factors inhibiting mobile game design and development process were noted as the barriers to the mobile learning implementation. These three studies performed in Turkey inform us that there are positive attitudes toward mobile learning and student teachers are willing to use it in teaching and learning on the premise that it is easy and fun to use mobile devices in the classrooms. However, there are a lot of barriers as mentioned above. Student teachers' attitudes were not different depending on their gender and major which can be interpreted as their major subjects.

In Malaysia, Ismail, Bokhare, Azizan & Azman (2013) performed a case study on Malaysian teachers' mobile phone acceptance and readiness. They found that the acceptance among respondents in terms of awareness and motivation to use technology in education, training and courses related to technology applied in the classrooms, the design of content for their training, technological support and facilities was high. But their readiness to use the technology was found to be at a considerably low level. However, there was a significant positive correlation between teachers' readiness for mobile learning with their awareness and motivation to use technology in education. They concluded that teachers' readiness for mobile learning would most likely increase if their awareness and motivation to use technology was also increasing. In another study on mobile learning, Pullen, J-F, Swabey, Abadooz, & Ranjit Sing (2015) performed a study on student teachers' acceptance and use of mobile learning in Malaysia. They found that performance expectancy, effort expectancy, social influence, attitude toward technology and self-efficiency are all significant determinants of behavioral intentions to use mobile devices for learning. What these two studies performed in Malaysia informed us that most of the teachers' acceptance toward mobile learning is at a high level, which means that they think mobile learning has many advantages for their teaching. However, their readiness to use mobile devices is considerably low. The

behavioral intentions of student teachers are very important, because their thinking and attitude can significantly affect teaching and learning.

A study on mobile learning was performed by Domingo & Garganté (2016) in Spain. They discussed a question which was what is the impact on learning that teachers perceive when mobile technology was used in their classrooms. The analysis showed that specific items that get higher scores deal with issues such as encouraging learner interest for learning content, promoting new ways of knowledge building, and improving information searching skills. Conversely, items with lower scores were fostering collaborative learning among students, encouraging work in team-based learning and promoting decision making processes among learners. It concluded that using mobile learning in classrooms had been seen by teachers mainly as a way to facilitate access to information, to provide new ways to learn, and to increase engagement in learning. By contrast, collaborative learning is the least appreciated learning impact.

In a study performed in the United States, Goad (2012) applied a Mann-Whitney U test to find no significant differences between STEM teachers and teachers of other disciplines in their attitudes to the importance of using technology in the classroom. However, a t-test showed STEM teachers rated themselves at a significantly higher skill level in their ability to design and access lessons using technology than the teachers of other disciplines. A significant and positive relationship was found that as the level of technology use increased the teacher's ability to design and access lessons improved. This study implies that technology skills precede mobile learning implementation. In the study of O'Bannon & Thomas (2014), they focused on teachers' age as it affects their attitudes on using mobile phones. They found that there were no significant differences for the teachers who were less than 32 years old and the ones who were 33–49 years old; however, they both significantly differed from those over 50 in mobile phone ownership and support for the use of mobile phones in the classroom as well as in their attitudes regarding the useful mobile features for school related work and instructional barriers. In each instance, the older teachers were less likely to own smartphones, were less supportive of the usage of mobile phones in the classroom, were less enthusiastic about the features, and found the barriers to be more problematic. Hur, Wang, Kale & Cullen (2015) did research which addressed how student teachers perceive mobile device integration in classrooms. The results showed that 72.5% of variances in student teachers' intention to use mobile devices were explained by perceived usefulness and self-efficacy for technology integration jointly, where perceived usefulness was the strongest predictor. The findings also demonstrated that constructivist beliefs and perceived ease of use indirectly influenced student teachers' intention to use mobile devices for teaching. The results of Hur & Bannon (2013) indicated that a majority of student teachers considered integration of a mobile device very useful for students, and they were willing to use them for teaching. However, they had concerns about classroom management issues, and a lack of skills hindered them from using the tool in classrooms. The above four studies performed in the United States inform us that teachers who are skillful with technology implement mobile learning in the classroom well. The group of teachers who are over 50 years of age experience difficulties and are less likely to utilize mobile devices in their class. Student teachers consider mobile devices highly useful yet they are not confident in managing their class with the use of mobile tools.

METHOD

Participant

The participants in this study consisted of 140 teachers at elementary and secondary schools in South Korea. They were invited to participate in this study while they were attending teacher training programs at several universities in Korea. Table 1 shows the demographic characteristics of these participants. Of these teachers, there were 64 (45.7%) males and 76 (54.3%) females. Elementary school teachers were 71 (50.7%), Secondary school (Middle school & High school) teachers were 69 (49.3%). Their teaching experience ranged from 2 to 34 years. They were divided into three groups so that each group could have a quite comparable number of teachers. Thus, teachers with less than 9 years' teaching experience were 51 (36.4%), teachers with teaching experience between 9 and 15 years were 47 (33.6%), and teachers with teaching experience with more than 15 years were 42 (30.0%), As to their subjects, there were 32 (22.9%) teachers in language arts, 42 (30%) teachers in science and 42 (30%) teachers are teaching all subjects. They are mostly elementary school teachers.

Table 1: Demographic Characteristics of Samples

	Independent variables	N	%
Gender	Male	64	45.7
	Female	76	54.3
School Level	Elementary	71	50.7

	Secondary	69	49.3
Teaching Experience	Less than 9 years	51	36.4
	Between 9 and 15 years	47	33.6
	More than 15 years	42	30.0
Subject	Language	32	22.9
	Science	42	30.0
	All	42	30.0

Questionnaire

The Mobile Learning Perception Scale (MLPS) developed by Uzunboylu and Özdamlı (2011) was used in this study. It includes three dimensions seeking teachers' feedback on three facets of mobile learning. They are 'Aim-Mobile Technologies Fit (A-MTF)', 'Appropriateness of Branch (AB)', and 'Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA and TSAC)'. The first dimension, A-MTF, has eight items (1, 2, 5, 8, 11, 13, 20, and 23). The second dimension, AB, has nine items (4, 9, 10, 14, 15, 17, 18, 21, and 24), the third dimension, FMA and TSAC, has nine items (3, 6, 7, 12, 16, 19, 22, 25, and 26). Thus, the Mobile Learning Perception Scale with 26 items was applied to the participants in this study.

The dimension of 'A-MTF (Aim-Mobile Technologies Fit)' contains statements describing the appropriateness of mobile learning goals to the goals of learning activities such as 'Mobile learning systems increase the quality of lessons', 'Mobile learning tools remove the limitation of time and space' and 'Utilization of mobile learning technologies increases students' motivation'. The dimension of 'AB (Appropriateness of Branch)' contains statements about the appropriateness of mobile learning to teaching such as 'Mobile learning applications are reliable for personal use', 'I would like to supplement my classes in future with mobile learning method' and 'Mobile learning applications are convenient to share my specialized knowledge with my colleagues'. The authors renamed this dimension as 'Appropriate of Mobile Devices to Teaching (AMDT) because the AMDT is better understandable to readers. In the dimension of 'FMA and TSAC (Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication)', it contains statements about the position of mobile learning in education and the sufficient merits of the applications of mobile learning for the purpose of communication such as 'Mobile learning applications can be utilized as a supplement of traditional education' and 'teacher-student communication can be established by means of mobile learning tools'.

Cronbach's alpha (a) value of this scale was 0.970; half-split reliability of the scale was .932. In detail, for the 'A-MTF' dimension, Cronbach's alpha (a) value was calculated as 0.894, half-split reliability was 0.881. For the 'AMDT' dimension, Cronbach's alpha (a) value was measured as 0.940, and half-split reliability was .915. Finally, for 'FMA and TSAC' dimension, Cronbach's alpha (a) value was calculated as .944, and half-split reliability was 0.942. The closer the reliability coefficient value gets to 1.0, the higher the reliability becomes. Thus, the internal consistency reliability of the scale used in this study can be considered as good (Uzunboylu & Özdamlı, 2011). As per the validity of the questionnaire, the Kaiser-Meyer-Olkin (KMO) was over .90 ($p > .60$), so the appropriation of data to the factor analysis was considered as the best. Approximately X2 value for BTS (Barlett's Test of Sphericity) was found 10163.312 ($p < .001$) for the study. The total variance obtained by three factors was estimated as 66.950% which is at the acceptable border. Besides, the interaction among all dimensions is strong (Uzunboylu & Özdamlı, 2011). Thus, it turned out reliable and valid as a scale in this study.

Analysis of Data

A T-test procedure was used to compare the means of male and female teachers' attitudes. Also a t-test was applied to test the teachers' attitudes according to their school levels. The ANOVA procedure of SPSS was adopted to analyze the differences among teaching experience levels and subjects. Tukey's HSD post hoc analysis was performed to locate the specific group differences in the teachers' attitudes.

RESULTS

Attitudes levels of Korean teachers

The first research question was "What are the attitudes toward mobile learning among Korean teachers?" A descriptive analysis was done as in Table 2 to answer this question.

Table 2: Descriptive Statistics on Teachers' Mobile Learning Attitudes

	N	Mean	Std. Deviation
A_MTF		17.11	4.12
AMDT	140	20.60	4.29
FMA_TSAC		21.63	4.59
Total Attitudes		60.34	10.28

In Table 2, the mean of FMA&TSAC dimension is the highest, A-MTF is the lowest, which denotes teachers' attitudes toward forms of mobile learning application and tools' with sufficient adequacy of communication are higher than the appropriateness of mobile learning to teaching. From the above table, the appropriateness of mobile learning goals to the goals of learning activities are the lowest. Each item value ranges from 1 to 5. So A-MTF (8 items) dimension can range from 8 to 40 in its value, resulting in the median score of 24. AMDT (9 items) dimension can have a value from 9 to 45. This is the same with FMA & TSAC (9 items) dimension. These two dimension's median is 27. The means of all three dimensions in Table 2 are below the median. Thus, teachers' mobile learning attitudes can be said as "low" in general.

Difference by gender

The second research question was "Do their attitudes toward mobile learning differ significantly according to their gender?" To answer this question, a t-test procedure was applied. The result is presented in Table 3.

Table 3: T-test for the Gender Difference on Mobile Learning Attitudes

	Male	(n=64)	Female	(n=76)	Mean	t	Sig.
	Mean	SD	Mean	SD	Difference		(2-tailed)
A-MTF	15.33	3.87	18.62	3.73	-3.29	-5.11	.000
AMDT	19.70	3.53	23.20	4.24	-3.49	-5.24	.000
FMA&TSAC	19.27	3.92	23.62	4.18	-4.35	-6.31	.000
Total Attitudes	54.30	8.46	65.43	8.85	-11.14	-7.57	.000

Notes. df = 138

As seen in Table 3, male and female teachers are different in attitudes toward mobile learning in three dimensions of "Aim-Mobile Technologies Fit", "Appropriateness of Mobile Devices to Teaching" and "Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication". Female teachers show higher attitudes than male teachers in all three domains. Especially in the dimension of 'Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication', the biggest difference exists (Mean Difference=-4.35). In sum, female teachers' attitudes are higher than male teachers. These differences are all significant statistically.

Difference by School Level

The third research question was "Do their attitudes toward mobile learning differ significantly according to the school levels they are teaching at?" To answer this question, t-test procedure was applied. The result is presented in Table 4.

Table 4: T-test for the School Level Difference on Mobile Learning Attitudes

	School level						
	Elementary (n=71)		Secondary (n=69)		Mean	t	Sig.
	Mean	SD	Mean	SD	Difference		(2-tailed)
A-MTF	16.92	3.97	17.32	4.29	-.40	-.58	.565
AMDT	21.94	4.53	21.25	4.03	.70	.96	.338
FMA&TSAC	20.14	4.61	23.16	4.07	-3.02	-4.10	.000
Total Attitudes	59.00	10.11	61.72	10.35	-2.72	-1.58	.117

Notes. df = 138

As seen in Table 4, elementary school teachers and secondary school teachers are not so much different in attitudes on dimensions of "Aim-Mobile Technologies Fit" and "Appropriateness of Mobile Devices to Teaching". But two groups show a difference in the dimension of "Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication". This difference is significant statistically ($p < .001$). Thus, it can be said that secondary school teachers' attitudes on forms of mobile learning application and tools' sufficient adequacy of communication is significantly higher than elementary school teachers. The mean difference is 4.10.

In the total attitudes, secondary teachers are higher than elementary teachers. But this difference is not significant. So secondary teachers are likely to put more focus on the forms of mobile learning application and tools' sufficient adequacy of communication than elementary teachers.

Difference by Teaching Experience

The fourth research question was "Do their attitudes toward mobile learning differ significantly according to their levels of teaching experience?" To answer this question, an ANOVA procedure was applied. The result is presented in Table 5.

Table 5: Means and Standard Deviations of Mobile Learning Attitudes by Experience Level

	< 9 (n=51)		9-15 (n=47)		> 15 (n=42)	
	Mean	SD	Mean	SD	Mean	SD
A-MTF	17.12	3.58	15.85	4.60	18.52	3.79
AMDT	20.14	3.16	21.77	4.45	23.19	4.76
FMA&TSAC	21.96	3.90	20.04	4.91	23.00	4.58
Total Attitudes	59.22	8.57	57.66	11.30	64.71	9.81

As seen in Table 5, the teachers with more than 15 years of teaching experience show higher attitudes than two other groups of teaching experience. The table shows that the teachers with less than 9 years' of teaching experience are more positive in the attitudes on forms of mobile learning application and tools' sufficient adequacy of communication, the teachers with 9 to 15 years' of teaching experience are higher in the attitudes on appropriateness of mobile devices to their teaching, and the teachers with more than 15 years' of teaching experience are lowest in the attitudes of aim-mobile technologies. One-way ANOVA was conducted to test the differences shown in Table 5. The result of one-way ANOVA was presented in Table 6. All differences among groups are statistically significant.

Table 6: ANOVA for Mobile Learning Attitudes by Experience Level

		Sum of Squares	df	Mean Square	F	Sig.
A-MTF	Between Groups	158.444	2	79.222	4.925	.009
	Within Groups	2203.728	137	16.086		
	Total	2362.171	139			
AMDT	Between Groups	216.659	2	108.330	6.340	.002
	Within Groups	2340.941	137	17.087		
	Total	2557.600	139			
FMA&TSAC	Between Groups	202.849	2	101.425	5.086	.007
	Within Groups	2731.836	137	19.940		
	Total	2934.686	139			
Total Attitudes	Between Groups	1205.791	2	602.895	6.125	.003
	Within Groups	13485.752	137	98.436		
	Total	14691.543	139			

The above table shows that there is a significant difference on the three domains of teachers' attitudes toward mobile learning at the .01 level for the three conditions [F (2,137) = 4.925, p =0.009], [F (2,137) = 6.340, p =0.002], [F (2,137) = 5.086, p =0.007]. Thus it can be said that all differences among the three groups of different teaching experience are statistically significant. In order to test which specific groups are different, Tukey's HSD post hoc analysis was performed and presented its result in Table 7.

Table 7: Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Teaching Experience Group	(J) Teaching Experience Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
A-MTF	< 9	9-15	1.27	.81	.266	-.655	3.188
	9-15	>15	-2.67*	.85	.006	-4.691	-.655
	> 15	< 9	-1.41	.84	.216	-3.386	.574
AMDT	< 9	9-15	-1.63	.84	.129	-3.609	.352
	9-15	>15	-1.42	.88	.239	-3.504	.655

	>15	< 9	-3.05*	.86	.002	-5.094	-1.012
FMA	< 9	9-15	1.92	.90	.089	-.221	4.058
&	9-15	>15	-2.96*	.95	.006	-5.204	-.711
TSAC	>15	< 9	1.04	.93	.505	-1.165	3.244
Total	< 9	9-15	1.56	2.01	.719	-3.1973	6.3095
Attitudes	9-15	>15	-7.05*	2.11	.003	-12.0464	-2.0630
	>15	< 9	5.50*	2.07	.024	.6002	10.3970

Notes. The mean difference is significant at the 0.05 level.

The above Table 7 presents the results of multiple comparisons showing which group differs from other groups. As seen in the above table, there is a significant difference between the teachers with 9 to 15 years' teaching experience and the teachers with more than 15 years' of teaching experience ($p < .01$) in Aim-Mobile Technologies Fit (A-MTF) dimension. The mean difference is 2.67. Thus it can be said that the group of teaching experience with more than 15 years shows more positive attitudes toward aim-mobile technologies fit dimension than the group of teaching experience with 9 to 15 years. In Appropriateness of Mobile Devices to Teaching (AMDT) dimension, there is a significant difference between the group of teaching experience with less than 9 years and the group of teaching experience with more than 15 years ($p < .01$). The mean difference is 3.05. Thus it can be said that the group of teaching experience with more than 15 years shows higher attitudes toward Appropriateness of Mobile Devices to Teaching (AMDT) dimension than the group of teaching experience with less than 9 years. In the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension, there is a significant difference between the group of teaching experience with 9 to 15 years and the group of teaching experience with more than 15 years ($p < .01$). The mean difference is 2.96. Thus it can be said that the group of teaching experience with more than 15 years shows more positive attitudes toward Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension than the group of teaching experience of 9 to 15 years. As per the total attitudes, there is a significant difference between the group with teaching experience of less than 9 years and the group of teaching experience with more than 15 years ($p <. 05$). There is also another significant difference between the group of teaching experience with 9 to 15 years and the group of teaching experience with more than 15 years. The mean difference is 5.50 for the former groups and 7.05 for the latter groups. Thus it can be said that the group of teaching experience with more than 15 years shows higher attitudes toward mobile learning than the groups of the less experienced.

Difference by Subject Matter

The fifth research question was identified as "Do their attitudes toward mobile learning differ significantly according to their school levels?" To answer this question, an ANOVA procedure was applied. The result was presented in Table 8.

Table 8: Means and Standard Deviations of Mobile Learning Attitudes by Subject Matter

	Language (n=32)		Science (n=42)		All (n=42)	
	Mean	SD	Mean	SD	Mean	SD
A-MTF	17.28	4.14	16.69	3.89	17.33	4.17
AMDT	21.41	4.57	20.55	3.39	22.29	4.95
FMA&TSAC	22.75	5.18	21.74	3.66	19.86	4.86
Total Attitudes	61.44	11.03	58.98	8.56	59.48	11.41

In Table 8 language, science teachers and teachers teaching all subjects have less positive attitudes toward Aim-Mobile Technologies Fit (A-MTF) dimension compared with the other two dimensions. As to appropriateness of mobile devices to their teaching, teachers teaching all subjects, mostly elementary teachers, show the most positive attitudes while science teachers show least positive attitudes. As to forms of mobile learning application and tools' sufficient adequacy of communication, language teachers are in the highest attitudes while all subject teachers are in the lowest attitudes. A one-way ANOVA was conducted to test the differences shown in Table 8. As a result, Table 9 was presented. There exists a significant difference in the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension among groups.

Table 9: ANOVA for Mobile Learning Attitudes by Subject Matter

		Sum of Squares	df	Mean Square	F	Sig.
A_MTF	Between Groups	10.360	2	5.180	.314	.731
	Within Groups	1866.778	113	16.520		

	Total	1877.138	115			
AMDT	Between Groups	63.443	2	31.721	1.689	.189
	Within Groups	2122.695	113	18.785		
	Total	2186.138	115			
FMA&TSAC	Between Groups	162.626	2	81.313	3.908	.023
	Within Groups	2351.262	113	20.808		
	Total	2513.888	115			
Total Attitudes	Between Groups	118.561	2	59.280	.553	.577
	Within Groups	12107.327	113	107.144		
	Total	12225.888	115			

The above table shows there does not exist a significant difference on the A-MTF (Aim-Mobile Technologies Fit) as well as on AMDT (Appropriateness of Mobile Devices to Teaching) dimensions of teachers' mobile learning attitudes. However, there exists a significant difference on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension of teachers' mobile learning attitudes at the $p < .05$ level among three groups [$F(2,113) = 3.908$, $p = 0.023$]. Thus it can be said that the three groups are different on the FMA&TSAC dimension of teachers' attitudes toward mobile learning. In order to test which specific groups are different, Tukey's HSD post hoc analysis was performed as in Table 10.

Table 10: Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Subject	(J) Subject	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
FMA&TSAC	Language	Science	1.01	1.07	.613	-1.530	3.554
	Science	All	1.88	1.00	.146	-.483	4.245
	All	Language	-2.89*	1.07	.021	-5.435	-.351

Notes. The mean difference is significant at the 0.05 level.

The above Table 10 presents the result of multiple comparisons showing which group differed from other group. We can see from the above table that in FMA&TSAC domain there is a significant difference between Language teachers and All subjects' teachers($p<.05$). The mean difference is 2.89. Thus it can be said that language teachers have higher attitudes toward FMA&TSAC domain than all subjects' teachers.

DISCUSSION AND CONCLUSION

Korean teachers' attitudes toward mobile learning are at as low level as in Turkey. Their attitudes are below the median in all three dimensions. However, among three dimensions, the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension shows the highest, while Aim-Mobile Technologies Fit (A-MTF) dimension is the lowest. That means teachers are more likely to admit that communication between teachers and students as well as among students are facilitated by means of mobile learning tools. They think that a mobile learning system increases the quality of teaching. Female teachers show more positive attitudes than male teachers in all three dimensions. Especially, female teachers approve the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication than male teachers. Even though female teachers' attitudes are higher than male teachers in Korea. This is not the case of Turkey. Turkish teachers' attitudes were not different depending on their gender (Serin, 2012).

Secondary school teachers' attitudes on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension are significantly higher than elementary school teachers. In the overall attitudes, secondary teachers are higher than elementary teachers. This implies that secondary teachers are more positive about the effectiveness of mobile learning applications for communication. They have more positive attitude that mobile learning is needed in teaching and learning than elementary school teachers. But this difference is not significant. So secondary school teachers are likely to put more focus on the forms of mobile learning application and tools' sufficient adequacy of communication than elementary school teachers. There were no studies from the others' countries available on the differences between mobile learning attitudes of elementary and secondary school teachers. But they did some research which concentrated on student teachers. Generally, the student teachers showed a high and positive willingness on the game based learning and integrating mobile games in their future profession. However, there are still some barriers make them feel less confident in managing their class with the use of mobile tools so that they are less confident in using them (Güleroğlu, 2015).

The teachers with more than 15 years of teaching experience show higher acceptance than the two other groups of teaching experience. Differences among the three groups with different teaching experience are statistically significant. Teachers with more than 15 years' teaching experience show more positive attitudes toward Aim-Mobile Technologies Fit (A-MTF) dimension than the teachers with 9 to 15 years' teaching experience. Teachers with more than 15 years' teaching experience show more positive attitudes toward Appropriateness of Mobile Devices to Teaching (AMDT) dimension than teachers with less than 9 years' teaching experience. Teachers with more than 15 years' teaching experience show higher attitudes toward the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension than those with 9 to 15 years' teaching experience. Thus it can be said that teachers with greater teaching experience approve using mobile learning than the less experienced. On the contrary, American teachers' mobile learning attitudes are different from Korean teachers' from the perspectives of teaching experience. In the study of O'Bannon & Thomas (2014), there were no significant differences for the teachers who were less than 32 years old and the ones who were between 33 and 49 years old. However, the group of teachers who are over 50 years old feel difficulties and are less likely to utilize mobile devices in their class.

There is not a significant difference on the Aim-Mobile Technologies Fit (A-MTF) dimension and the Appropriateness of Mobile Devices to Teaching (AMDT) dimension of teachers' mobile learning attitudes according to the subjects they are teaching. However, there was a significant difference on the Forms of Mobile Learning Application and Tools' Sufficient Adequacy of Communication (FMA & TSAC) dimension of teachers' mobile learning attitudes among teachers' group based on their teaching experience. That is, language teachers show higher attitudes toward FMA&TSAC dimension than all subjects teaching teachers. In a study performed in Turkey, teachers' attitudes were not different depending on their department which can be interpreted as their major subjects (Serin, 2012).

Mobile learning is a relatively new field in research and exploration by many researchers around the world. It offers a way of learning new techniques to improve the mastery of knowledge in society (Nawi, Hamzah & Abdul Rahim, 2015), especially for teachers and students. This is because teachers' attitudes toward mobile learning could be an initiating drive for this new medium to exert its power to enhance learning achievements of student in as well as outside of classrooms. The next step for the research in this field would be how teachers' attitudes forces mobile devices' use in classroom and how they will improve teaching and learning in terms of students' achievements.

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The Effect of Using Online Discussion Forums on Students' Learning

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ABSTRACT
This study was conducted to investigate the effect of using online discussion forums (ODFs) on students' learning, particularly on their achievement. In order to achieve this, a quasi-experimental design was implemented during one academic semester at one of the leading universities in Saudi Arabia. The sample of this study involved undergraduate students (N = 138) divided into two groups: the experimental group involved 67 students and the control group involved 71 students. The findings indicate that using ODFs is likely to lead students to gain a better achievement. In addition, statistical analyses reveal significant and positive relationships between student participation in ODFs and their final course mark, but no significant relationships between their participation in ODFs and grade point average. The social interaction and the collaborative nature in ODFs environments as well as the active learning in blended learning courses were likely to be the possible reasons for the increased achievement when students utilise ODFs to enhance traditional learning. However, contextual dimensions need to be given a great deal of attention in order to find satisfactory results.

Keywords: Online discussion forums (ODFs), achievement, higher education, Saudi Arabia.

INTRODUCTION
Online discussion forums (ODFs) are widely implemented in university contexts as an important part of the teaching and learning process (AlJeraisy, Mohammad, Fayyoumi, & Alrashideh, 2015; Andresen, 2009; Blackmon, 2012; Chang, Chen, & Hsu, 2011; He, 2012; McNamara & Burton, 2009). Recently, ODFs have been used in many Saudi universities to supplement traditional learning classes (Hamdan, 2014b), that is in blended learning courses. The social online environment in which ODFs are integrated into traditional learning classes could be considered as an application of the social constructivism theory. Vygotsky (1978) considered learning to take place socially, in a social context, and develop through relationships with other students before it is internalised inside the student. Vygotsky (1978) posited that social interaction is a crucial requirement for full cognitive development. According to Al-Ibrahim and Al-Khalifa (2014), the social constructivism theory is "applicable to all educational contents and activities" (p. 1). They reported that online discussion in a social environments "promotes the development of communication and social skills and encourages dialogue and collaboration between students as found in social constructivism theory" (2014, p. 1). Pedagogically, in traditional learning, discussion is mostly led by academic staff as teacher-centered learning represented in the lectures, but discussion in ODFs could be led by students in most cases, then the role of academic staff becomes one of facilitator in student-centered learning.

Interestingly, Alamri, Cristea, and Al-Zaidi (2014) found that Saudi students prefer to work collaboratively and they appreciate their peers' advice to improve their learning. Alamri et al. (2014) revealed that students are likely to have positive intentions towards using ODFs because the use of ODFs supports social interaction and teamwork. Importantly, they found that collectivism has a significant positive influence on a student's perception of learning (Alamri et al., 2014). Holmes, Tracy, Painter, Oestreich, and Park (2015) asserted that collaborative discussion occurs in traditional learning and extends in ODFs increasing active knowledge acquisition, because using ODFs can engage students in active learning. In ODFs, "engaged students are mentally involved in their learning through deep thinking and interactive activities and educational experiences" (Salter & Conneely, 2015, p. 18).

Because of the social interaction and the collaborative environment, using ODFs can have a positive effect on students' learning in the Saudi higher education context (Al-Ibrahim & Al-Khalifa, 2014; Alamri et al., 2014; AlJeraisy et al., 2015; Ismail, Mahmood, & Babiker, 2013). For example, Ismail et al. (2013) examined the differences in the students' degree of participation between the online lab which utilises ODFs and the traditional computer lab. They found that students in the online lab performed significantly better, in terms of their degree of participation, than the students in the traditional lab. Importantly, Ismail et al. (2013) highlighted that using

ODFs improved the students' learning skills and the relationships among them due to the collaborative nature of the work in the ODF environment. Most recently, AlJeraisy et al. (2015) found that students with access to ODFs had socially influenced their peer group slightly more than those students who had no access to ODFs, although both groups were using the learning management system: Moodle. They also found that using ODFs made students more confident about their performance and more active and participative with other tools within the Moodle. AlJeraisy et al. (2015) added that students who had access to ODFs "felt the interaction and collaborative experience to be a positive one that helped increase their knowledge and understanding of the course material" (p. 256).

LITERATURE REVIEW

The effect of using ODFs on students' achievement

Student achievement is the ultimate goal of the educational process. Achievement can be defined as the grade that students obtain on their achievement tests. The effect of using ODFs on students' achievements is well recognised. Previous research demonstrated that using ODFs can have a positive effect on student achievement (Jacob, 2012; Koole, Vervaeke, Cosyn, & De Bruyn, 2014; Shana, 2009; Wei, Peng, & Chou, 2015; Xia, Fielder, & Siragusa, 2013).

In the Saudi higher education context an early investigation that was conducted by Al-Jarf (2002, 2004a, 2004b, 2005b, 2006) at King Saud University showed that using ODFs with Saudi female students had a positive effect on their English language achievement. In particular, she found that students who used ODFs performed significantly better in their exams, in terms of writing achievement (2002, 2004a, 2004b), grammar achievement (2004a, 2005b) and cultural awareness achievement (2004a, 2006) than students who did not use them. Alghamdi (2013) investigated the pedagogical implications of using ODFs within the Blackboard for the learning improvement of female students who were enrolled in a professional development and competencies course at a private university. She revealed that the students in the experimental group scored higher than those in the control group on the post achievement test. By providing examples, Alghamdi demonstrated that students in the experimental group had more understanding of course concepts and were more able to discuss various topics. Alghamdi (2013) concluded that "the use of online discussion as a supplement to in-class discussion improves students' achievement and learning in higher education, at least in this particular context" (p. 74). Most recently, AlJeraisy et al. (2015) investigated the impact of using ODFs on students' achievement at a private university studying a course in the Faculty of Business Administration. The study involved 60 students divided equally into two groups, whereby both groups were using Moodle. Online discussion forums (ODFs) were only available to the experimental group. They found that the group with access to ODFs scored significantly higher on the studied unit exam than the group without access to ODFs. In addition, the students who had access to ODFs were more confident about their performance in terms of exam results as a great percentage of them rated their expectations as either very good or excellent.

These studies indicated that using ODFs was likely to be the reason for the increased levels of student achievement. However, with the exception of AlJeraisy et al.'s study (2015) in which the students' gender was not identified, these studies were limited to female students. Al-Jarf's studies (2002, 2004a, 2004b, 2005b, 2006) were conducted for English courses at a single public university, whereas the studies of Alghamdi (2013) and AlJeraisy et al. (2015) were conducted for business courses at private universities. It also appears that English was the medium of instruction for the courses that utilised ODFs in these studies. However, when the medium of instruction is in the Arabic language, the use of ODFs seems to be more important. Lack of adequate English language proficiency for students was one of the barriers to adopting e-learning in Saudi universities, even when they were studying in an English context (Mayan, Sheard, & Carbone, 2014).

Student participation in ODFs and their achievement

Participation in ODFs means the ability of students to write initial posts, such as writing a new topic/thread, and to respond to academic staff and other students' posts as reply posts. Students who only read other student posts without making any contribution to the online discussion are known as lurkers, as described by several researchers (e.g., Knowlton, 2005; Palmer & Holt, 2010; Zhu, 2006). Participation is also termed to be interaction, and interchangeably appears to be used with other terms such as communication, engagement and involvement (AlJeraisy et al., 2015; Jordan, 2011). The relationships between participation in ODFs and students' achievements have been investigated by many researchers (Al-Jarf, 2004a, 2005b, 2006; Alghamdi, 2013; AlJeraisy et al., 2015; Buckley, 2011; Canal, Ghislandi, & Micciolo, 2015; Carceller, Dawson, & Lockyer, 2013, 2015; Hartnett, 2012; He, 2012; Koole et al., 2014; Palmer & Holt, 2010; Palmer, Holt, & Bray, 2008; Song & McNary, 2011). In particular, the correlation between the number of times students participate in ODFs and the students' final course mark or an activity that ultimately contributed to the students' final course mark.

However, the literature review showed mixed findings for the relationship between student participation in ODFs and their achievement. For example, while in the same context AlJeraisy et al. (2015) found significant relationships between the number of times students participate in ODFs and their achievement, similar findings in other contexts were reported by Carceller et al. (2013, 2015), Koole et al. (2014), Palmer and Holt (2010) and Palmer et al. (2008). Interestingly, it was found that students who actively participated in ODFs were likely to achieve a higher final course mark, and this was more marked in a blended learning than in fully online learning environments (Carceller et al., 2013, 2015). These findings consistently confirmed that student participation in ODFs did contribute significantly to their achievement. In contrast, no significant relationships were found in Song and McNary's study (2011). It should be highlighted that, while the majority of previous studies that have found significant correlation were conducted with undergraduate students, Song and McNary's study was conducted with postgraduate students, and that little variation in students' grades was reported (Song & McNary, 2011). However, a mixture of different relationships was found among undergraduate students in the same context by Alghamdi (2013) and elsewhere by Hartnett (2012).

Arguably, these mixed findings are likely to be attributable to situational dimensions. In Alghamdi's study, although the students had gained prior experience at using learning management systems, particularly Blackboard, but not with ODFs, the mixed relationships are likely to be attributable to the voluntary basis of participation, even though extra marks were given, and to the limited time students had to give to participation (Alghamdi, 2013). In the Saudi higher education context, students are not likely to engage in an online activity that does not officially contribute to the final course mark (Al-Jarf, 2005a). A lack of time also has been identified as one of the main barriers for university student participation in ODFs in Saudi Arabia (Alebaikan, 2010) and internationally (Birch & Volkov, 2007; Cheung, Hew, & Ling Ng, 2008; Hew & Cheung, 2010; Pena-Shaff, Altman, & Stephenson, 2005), particularly with worker students (Wilkinson & Barlow, 2010). Hew and Cheung (2010) found that the student decision to participate in ODFs depended on the availability of time they had. In addition, it can be argued that the mixed relationships in Hartnett's (2012) study are likely to be attributed to the different instructional design used within each case study. The significant relationship was found in the case study in which students were required to work collaboratively and to complete the task together within a six week period; in addition to that, a high weighting (60%) was dedicated towards their final mark. In other words, participating online was essential. However, this was not the case with the other case study where a lack of any significant relationship was found. In this case study, students were required to work individually, to complete the task more independently within a four week period, and then to participate online wherein a lower weighting (40%) was dedicated towards the final mark. In other words, participation was not directly linked to collaboration with others. This indicates that the different nature of the tasks within each case study was likely to be the possible reason for the contradictory results found by Hartnett (2012).

Interestingly, individual differences may also influence student participation in ODFs, and therefore influence their achievement. Students' prior academic performance, as measured by grade point average (GPA), was found to be an influential dimension that positively affected their participation in the ODF environment. That means good students are likely to participate actively in ODFs and to complete their course, having sent a higher number of posts. For example, He (2012) found that "students who actively participate in online discussion have good academic performances" (2012, p. 854) in which their GPAs were greater than 3.4/4. In other words, students who have high academic performance are likely to participate more than students with lower academic performance. This also highlights another point of view: that good students are likely to engage more with ODFs because they engage with all forms of learning and therefore submit a higher number of posts. To sum up, it is evident that contextual influences play a critical role in determining whether any significant relationships can be detected. Thus, it is fundamental to take into account consideration of such influences mentioned above when implementing ODFs in the higher education context.

RESEARCH QUESTIONS

This study aimed to investigate the effect of using ODFs on students' learning, particularly on their achievement by fulfilling the following research questions:

Q1- What is the effect of using ODFs on students' achievement?
Q2- What is the relationship between student participation in ODFs and their final course mark?
Q3- What is the relationship between student participation in ODFs and their prior grade point average?

SIGNIFICANCE OF THE STUDY

The use of online discussion forums (ODFs) is not innovative in itself, but blending online discussion to extend traditional learning is a new approach in the Saudi higher education context. Recently, the majority of Saudi public universities have paid a great deal of attention to the adoption of new ICT tools for teaching and learning (Alharbi & Drew, 2014). As this study intends through its findings to enhance traditional learning by providing

more effective learning environments, this change in teaching approaches creates concerns about whether discussion in an online learning environment will enhance the learning process. Determining the effect of using ODFs, and how successful the implementations of it could be, is crucial prior to actual adoption. For this reason, gaining further understanding of the use and effect of ODFs is worthwhile.

METHODOLOGY

Design and sampling

A quasi-experimental design was employed for this study in which existing groups were utilised (Creswell, 2012). One of the leading public universities located in the Western Region of Saudi Arabia was selected as the site for this study for reasons of both typicality and convenience. It is broadly typical of many such Saudi institutions and it was also the author's primary place of work, which made access easier to arrange. In this study, convenience sampling was instituted which ended with a sample of three academic staff and 138 students from six classes who agreed to take part in this study during semester one, 2013-2014. The 138 students were enrolled at the Faculty of Education and had identical characteristics as they were undergraduates, studying full time on campus, males, and Saudi citizens. The majority of them (135) were studying Special Education whereas three students in the experimental group were studying Quranic studies. The grade point average (GPA) of the experimental group students (67) was as follows: 22 students had good GPAs, 43 students had very good GPAs and two students had excellent GPAs.

Course design

The 138 students involved in this study were enrolled in six classes, studying three different courses in educational technologies department. The students were divided into two groups: the experimental group involved 67 students within three classes and the control group involved 71 students within the other three classes. Each class of students in the experimental group was studying the same course as their counterpart in the control group, and was taught by the same academic staff member. The experimental group students were taught and then asked to participate in ODFs as blended courses, whereas the control group students were taught the same course and followed the same teaching method, but were not required to participate in ODFs. That means, in addition to the traditional class discussion, the experimental group students were exposed to an online discussion in an ODF for the same content as a supplementary pedagogical tool alongside their face to face classes, which was not the case for the control group students. Both groups, therefore, used the same textbooks and were exposed to the same content and instruction in the traditional classes. Thus, the grading scheme was the same for both groups.

Pre/post achievement tests

Achievement tests are defined as those tests "designed to measure the degree of learning that has taken place after a person has been exposed to a specific learning experience" (Johnson & Christensen, 2014, p. 181). In this study, pre/post achievement tests were designed by the three academic staff accompanied with answers guides. Since they were teaching different courses, these tests were different. Moreover, these tests involved different types of formats, such as true/false, multiple choice and fill-in. In addition, they were formulated in the Arabic language since all students who were involved in this study were Arabic native speakers. These tests were the same tests that were being used in the normal courses, which should have addressed the threats to the tests' validity and reliability. This is because the design of each test was considered by some academic staff in the department, those who teach the same courses and was modified over time. The administration of these tests was conducted by the author with the supervision of the three academic staff at a time of 10 minutes for each test. These tests were implemented as a traditional test - in paper-and-pencil format – and were marked by the author.

Online discussion forums (ODFs)

Typical ODFs were designed in Arabic language for this study. This was achieved with a Saudi design company named the TXT Company for Integrated Web Solutions and Services (www.txt-txt.com.sa). This company was also responsible for hosting and providing 24 hour technical support to the ODFs. A consistent style was used in the design of the three ODFs, so that it was clear and easy to follow and navigate within. There were many features of the style; however, the most obvious one was the ability to change the style colour. The participants were able to choose the preferred colour from four colours: dark purple, green, blue and red. The default colour of the style was blue, with that decision having been made after consulting the three academic staff.

The content of the ODFs was related to the courses of study. Each ODF contained the relative course content. No advertisements were used, unlike in many ODFs, in order to encourage the students to focus on the course content without any distraction. The management of the ODFs was administrated by the author, which also has given the students an instructional session for each class in the experimental groups regarding the use of ODFs, including how to log in, view posts, create initial posts, reply to posts, format posts and upload materials. Since

the three academic staff members were from the Department of Educational Technology, they were sufficiently capable and experienced in using ODFs. In particular, there were three ODFs, and each one had ten forums for ten weeks of topics, so that each week had a special forum regarding a specific topic for that week. In the instructional session, students were provided with an instruction sheet for writing posts that was derived from previous studies (e.g., Jordan, 2011; Lee, 2009; Palmer & Holt, 2010). In addition, students were provided with an assessment rubric that was derived from previous studies (e.g., Edelstein & Edwards, 2002; Kleinman, 2005; Nandi, Hamilton, & Harland, 2012). The students were required to complete two tasks in the ODFs, which were adopted from previous studies (e.g., Palmer & Holt, 2010; Palmer et al., 2008). There was also an assessment sheet for academic staff, which was adopted from Baker's study (2011) with minor additions and completed by the author anonymously every week with no engagement with students. This was due to the high workload of the three academic staff which hindered their ability to take part in this role. However, participation was voluntary. Moreover, each experimental group had a separate online forum that had a unique link, so that students from other experimental groups could not register and participate in the forums that were not assigned to them. In addition, as ODFs require that a user registers and creates a password, each student registered using a code; the first three letters of the father's name followed by the last three numbers of the student ID. Therefore, registration was anonymous.

DATA ANALYSIS PROCEDURES

To facilitate the analysis procedures, the Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel were used. The achievement tests data were initially entered into Excel files. Then the data were coded and entered into the software package SPSS. In case of the experimental groups' students, the same ID code that had been used to register in the ODFs for each participant was also used as the ID code for the achievement tests. In the case of the control groups' students, each participant was given an ID code from 01 through to 71. After that, analytical procedures including independent samples t-tests and paired samples tests were conducted to examine the differences between the two groups. The ODFs data were analysed quantitatively based on the number of initial postings and reply postings when students finished the courses at the end of the semester. As quantitative analysis was conducted to analyse the data of ODFs, there was no need to transcribe the Arabic content into English. The data were initially entered into Excel files. Then the data were coded and entered into the software package SPSS using the same registration ID code in ODFs for each student. After that, descriptive analyses were conducted, such as the total number of initial and reply posts, to describe student participation in the ODFs. In addition, the relationships between the statistical data of ODFs and students' achievement were examined. In this study, the significance level at 0.05 was applied. According to Field (2009), when the "observed significance is less than .05, then scientists agree that the result reflects a genuine effect" (p. 208). Johnson and Christensen (2014) added that "most educational researchers use .05 as the significance level" (p. 567).

RESULTS

Pre/post achievement tests analysis

The 67 students in the experimental groups were studying by using ODFs alongside traditional learning, while the 71 students in the control groups were studying by traditional learning alone. Both groups completed the pre/post achievement tests in three undergraduate courses. In regard to the pre-achievement test results, conducting the independent samples t-test shows no significant differences between the pre-achievement test mean scores of the experimental and control groups, indicating no significant differences in the background knowledge of the three courses between the groups before the experiment ($t = .028$, $df = 136$, $p = .978$). Moreover, the student grade point averages (GPAs) were collected to examine whether there were any significant differences in their general ability. The experimental group had higher mean score ($M = 3.61$) than the control group's mean score ($M = 3.49$). However, the independent samples t-test revealed that this was not statistically significant ($t = 1.788$, $df = 136$, $p = .076$). After that, the effect of each learning method was examined by using the paired sample t-test, as is shown in Table 1.1.

Table 1.1: Achievement Tests' Results of Students

Group	Group statistics					Paired samples test		
	Test	N	M	SD	SE	T	df	Sig. (2-tailed)
Experimental group	Pre test	67	10.09	3.460	.423	-6.543	66	.000*
	Post test	67	12.05	2.844	.347			
Control group	Pre test	71	10.07	3.178	.377	-3.861	70	.000*
	Post test	71	10.96	3.053	.362			

* $p < .05$.

The results in Table 1.1 reveal a significant difference between the pre/post achievement test mean scores of the experimental group at the .05 level (t = - 6.543, df = 66), suggesting that experimental students' achievement was significantly improved as a result of exposure to a combination of traditional learning and the use of ODFs. Similarly, a significant difference between the pre/post achievement test mean scores of the control group was found at the .05 level (t = - 3.861, df = 70), suggesting that achievement in the control group was significantly improved as a result of studying through traditional learning alone, which depended on the oral and PowerPoint presentations only. However, the paired t-test results do not show which group made higher gains. Therefore, the independent samples t-test was used to examine the differences of the post achievement tests between the experimental and control groups, as is shown in Table 1.2.

Table 1.2: Post Achievement Test Results of Students

Group	Group statistics				Levene's test		T-test for equality of means		
	N	M	SD	SE	F	Sig.	T	df	Sig. (2-tailed)
Experimental group	67	12.05	2.844	.347	1.758	.187	2.168	136	.032*
Control group	71	10.96	3.053	.362					

* $p < .05$.

The test results in Table 1.2 indicate significant differences between the experimental and control groups post achievement tests mean scores in the three courses (t = 2.168, df = 136, $p < .05$), suggesting that achievement in the experimental group was higher than in the control group at the end of the semester as a result of using ODFs alongside traditional learning. To conclude, the experimental group students had a higher achievement outcome score than the control group students.

Online discussion forums (ODFs) analysis

The students in each experimental class were supposed to complete 10 threads by submitting two weekly posts per student during 10 weeks of study. Table 1.3 shows the descriptive data of the three ODFs.

Table 1.3: Descriptive Data of Student Participation in ODFs

Class	N (%*)	Total number of			
		Threads N (%**)	Initial posts N (%**)	Reply posts N (%)	Posts N (%)
Class A	16 (23.88)	7 (70.0)	68 (42.5)	71 (44.38)	139 (43.44)
Class B	31 (46.27)	9 (90.0)	124 (40.0)	124 (40.0)	248 (40.0)
Class C	20 (29.85)	10 (100)	82 (41.0)	75 (37.5)	157 (39.25)
Total	67 (100)	26 (86.67)	274 (40.9)	270 (40.3)	544 (40.6)

* These percentages are out of the total number of participants. ** These percentages are out of the total number of the required threads that was 10 threads per class (e.g., students in Class A participated 70% of the required threads) or the required posts, that was one initial post and one reply post per participant weekly (e.g., students in Class A submitted 42.5% of the required initial posts, that was160 initial posts).

Table 1.3 shows that the three classes did not complete the required tasks in terms of the total number of threads, with the exception of Class C. It is noteworthy that none of the three classes had even completed half of the required number of posts. Although the lowest number of students was in Class A, who had the lowest proportion in terms of the completed threads, they had the highest proportion in terms of the submitted posts in ODFs. Thus, this class was the most active class, whereas Class C was the least active class. In addition, the number of students between the three classes was unequal and had a positive relationship with the total number of posts. The number of the weekly posts was also mixed within each class and between the three classes, as is shown in Figure 1.1.

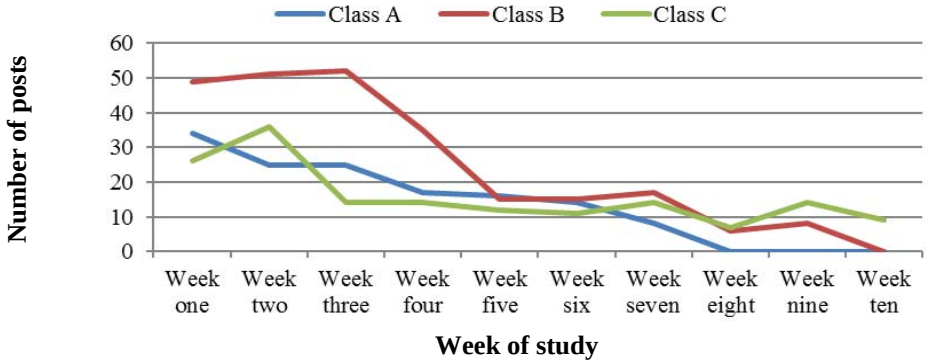

Figure 1.1: The number of students' weekly posts in ODFs

Figure 1.1 shows that the students were participating actively in the first three weeks of study and that a dramatic decrease was noticed after that, especially for Class B and Class C, until week five. At mid semester, during weeks five and six, students from the three classes were participating quite equally. It should be noted that the students had an official vacation during these two weeks. Interestingly, the fluctuations in the number of the weekly posts had a similar shape for Class B and Class C during the 10 weeks of study.

Statistical data from the three ODFs reveal that the most active student made 29 posts from Class C followed by another two students who made 25 and 19 posts from the same class during the 10 weeks; whereas three students from the same class were seen as lurkers as they did not make any contributions. It was also noticed that students were trying to do only the two required posts each week, particularly in the first three weeks when the majority of students were participating in the ODFs. In addition, two academic staff registered in the ODFs without making any contribution and the third one did not register at all. This means that the three academic staff did not engage with their students in the ODFs. It was also noticed that the students used some of the features of the ODFs. Most of the students edited their posts properly, as they used punctuation and the numbering of points as well as using different features of the ODFs editor, such as colour, font style and size. They also used some of the ODFs icons to express their emotions and to motivate each other.

Relationships between participation in ODFs and achievement

A linear regression analysis was used to investigate the relationships between student participation in online discussion forums (ODFs) and their achievement, as is shown in Table 1.4.

Table 1.4: Relationships between Participation in ODFs and Achievement

Independent variable	Dependent variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig	R^2
		B	Std.Error	β			
Number of initial posts	Final course mark	0.67	0.19	.41	3.57	.00	.16*
Number of replies posts		0.84	0.19	.48	4.37	.00	.23*
Total number of posts		0.40	0.10	.45	4.11	.00	.21*
Grade point average	Number of initial posts	2.09	1.10	.23	1.90	.06	ns.
	Number of replies posts	1.52	1.04	.18	1.46	.15	ns.
	Total number of posts	3.60	2.06	.21	1.75	.09	ns.

* $p < 0.05$.** ns.: The regression model was not significant ($p > .05$).

The results of the singly regression analysis models in Table 1.4 show that all relationships with the final course mark were found significant. In particular, the results show that significant and positive direct relationships were found between student participation in ODFs and their final course marks with β value ranged from .41 to .48, and that each regression analysis model explained about 20% of the observed variance in students' final course marks. It should be highlighted that the aim of this study was to investigate the effect of the student participation in ODFs on their final course marks as an indicator to its effect on their achievement, although there are many dimensions that are likely to affect their final course marks. Thus, the effect on student participation in ODFs by 20% as a single dimension was not considered slight. The β values indicate that the number of posts did significantly predict higher final course mark. Overall, these results suggest that higher participation in ODFs may lead to higher final course mark, especially for the replies posts (β=.48). However, there were no significant relationships between student participation and their prior grade point average (GPA). This indicates that students are likely to participate in ODFs equally regardless of their prior academic performances.

DISCUSSION

The results of the pre and post achievement tests, as well as the statistical data from online discussion forums (ODFs) represented in the number of posts, reveal that using ODFs was likely to be the reason for the significant increase in the experimental group students' achievements. In regard to the achievement tests, student results in Table 1.2 indicate that there are significant differences between the experimental and control groups post-achievement mean test scores. It suggests that achievement in the experimental group was significantly higher than in the control group at the end of the semester, although the control group had significant improvement due to the effectiveness of traditional learning as well (see Table 1.1). This significant finding indicates that using ODFs alongside traditional learning classes may lead to higher student achievement, which is consistent with a number of other studies that have indicated that using ODFs can have a positive effect on student achievement in the same context (Al-Jarf, 2002, 2004a, 2004b, 2005b, 2006; Alghamdi, 2013; AlJeraisy et al., 2015) and in other contexts (Jacob, 2012; Koole et al., 2014; Shana, 2009; Wei et al., 2015; Xia et al., 2013). However, in comparison with the previous studies in the same context mentioned above, the present study seems to be the first study that has investigated the effect of using ODFs on male students' achievements at a public university in

the Western Region area of the country. Additionally, it appears to be the first study that has applied the use of ODFs for Arabic courses within the Faculty of Education. More importantly, the majority of previous research in the same context utilised ODFs within different platforms of learning management systems, such as Blackboard and Moodle, in which other tools within these systems may have had a potential impact on the positive results that were found. In contrast, students in the present study utilised public ODFs that had been designed for this purpose and there were no other tools available to them. There were also no announcements about the blended learning course or to motivate students to participate in ODFs. In other words, although the utilised ODFs in the present study may lack formality because they were not part of the official learning management systems within the university's system, they yielded a positive effect on student achievement which is likely to be genuinely attributable to the utilisation of ODFs.

In regard to the number of posts and achievement levels, the results in Table 1.4 show there were no significant relationships between the student participation in ODFs and their prior grade point average (GPA). This does not only indicate that good students are more likely to participate actively in ODFs, but an equal participation is suggested. This finding is consistent with the work of Pena-Shaff et al. (2005), who found that ODFs "allowed all students the same opportunity to participate and communicate their thoughts" (p. 418). However, it contrasts with the work of He (2012), who found that students with previously above average academic performance were more likely to participate actively in ODFs. Although student academic performance was not reported in He's study (2012), the results of the present study show that the majority of students had very good GPAs, so that the meagre variation in their GPA values in general was likely to be the reason for the lack of significant relationships with their participation level, or it might be that students were participating equally in ODFs regardless of their prior academic performance.

However, there were significant and positive relationships between student participation in ODFs and their final course mark (see Table 1.4). The results of the regression analysis models in Table 1.4 show significant and direct positive relationships between student participation in ODFs and their final course mark, indicating that higher participation in ODFs is likely to lead students to achieve a higher final course mark. This finding is consistent with some of the previous research that has found that the number of posts is positively correlated with the final course mark. While similar relationships were found in the same context (AlJeraisy et al., 2015) and elsewhere (Carceller et al., 2013, 2015; Koole et al., 2014; Palmer & Holt, 2010; Palmer et al., 2008), the findings of Song and McNary (2011) suggested no correlation between the number of posts and students' final course mark. Moreover, mixed relationships were found in the same context (Alghamdi, 2013) and elsewhere (Hartnett, 2012).

These mixed findings of previous studies indicate a complex relationship between student participation in ODFs and their final course mark that is sensitive to contextual dimensions. It can be argued that the lack of any significant relationship in Song and McNary's study was due to the implementation of ODFs in "a graduate level course and there was little variation in students' grades" (Song & McNary, 2011, p. 12). While it seems that the majority of previous studies and the present study have found this association with undergraduate courses. Similarly, Bye, Smith, and Rallis (2009) confirmed that using ODFs with graduate courses did not result in better course grades. Students in this study were all undergraduates, in which they are likely to study more courses than postgraduates, which in turn is likely to make their grades more varied. The mixed relationships found in Alghamdi's study (2013) were likely to be attributed to the unofficial assessment and the lack of time, but student participation in the present study was voluntary and the lack of time appeared to be a serious issue for them. The majority of them were participating in the evening as observed in the statistical data in ODFs which might be due high student commitments. Students in the present study also had similar instructional design in the traditional and blended courses, but using different instructional design in the internet-based courses was likely to be the potential reason behind the inconsistent relationships in Hartnett's study (2012). In other words, it appears that the relationship between student participation in ODFs and their final course mark is correlational, depending on contextual dimensions.

Consequently, it is not possible to definitively conclude that participation in ODFs leads to significantly higher achievement. The findings of the present study provides some evidence to support this assertion, but it is likely that the students would have achieved satisfactory final course marks regardless of whether ODFs were utilised in this study. However, there are many possible reasons for the significant findings found in the present study, as follows. The social interaction and the collaborative nature in ODFs environments were likely to be a possible reason for the significantly increased achievement levels of the experimental group students. Students in the present study had no prior online educational experience which demonstrated that using ODFs in educational contexts was a new experience. This may be due to the prevalence of traditional pedagogical practises in this particular university, confirming the assertion of traditionalism of pedagogical practises in the Saudi universities

by previous research (e.g., Al-Zahrani, 2015; Alebaikan & Troudi, 2010; Colbran & Al-Ghreimil, 2013; Hamdan, 2014b). In other words, a lecture-based classroom seems to be the main teaching method used by academic staff that is likely to lack social interaction and collaboration between the students. In contrast, Saudi students have been found to prefer to work collaboratively and appreciate their peers' advice to improve their learning, and that collectivism has a significant positive influence on their perception of learning (Alamri et al., 2014). Thus, engaging in ODFs was likely to be a great opportunity for students to improve their learning in a new learning experience that was a blended learning course, and in turn this perhaps helped them to understand the course more thoroughly and, ultimately, to achieve higher grades. This finding is consistent with previous research in the same context that has indicated that the social interaction and the collaborative nature of ODFs has a positive effect on students' learning (Al-Ibrahim & Al-Khalifa, 2014; Alamri et al., 2014; AlJeraisy et al., 2015; Ismail et al., 2013).

In practice, although the submission of the two weekly posts in the ODFs was an individual task, the completion of the tasks was based on the collaboration arrangement between the students, which may also have encouraged them to interact more socially. For the first task, students were required to submit different initial posts, so they had to read all others' posts and then participate in the ODFs. In the second task, they were required to comment on their peers' posts. In other words, they could not complete the tasks individually, especially the second one and for later posting students in case of the first task, without depending on their peers' contribution. In other words, intentionally and unintentionally, all students worked collaboratively and socially.

One possible reason for this was likely to have been the active learning in blended learning courses. Although the experimental and control group students used the same textbooks and were exposed to the same content and instruction in the traditional and blended courses by the same academic staff, the experimental group students had another way of dealing with content. Students were engaged in different forms of learning, traditional learning in class and participating in ODFs, which in turn possibly lead them to more active learning. This is supported by the work of Carceller et al. (2013, 2015), who found that students' participation was significantly correlated to students' achievement in blended learning environments more than in fully online learning. This means that engaging students in different forms of learning is likely to lead to a better achievement (Shana, 2009). Using ODFs in blended learning courses "can be engaging learning activities" (Salter & Conneely, 2015, p. 18) and, therefore, can engage students in active learning (Holmes et al., 2015). In the same context, AlMahamoud and Elebiary (2013) found that students' higher achievement is most likely to be "impacted by the more active classroom teaching approach utilized in the blended course format" (p. 4658), and that blended learning contexts can make students active (AlJeraisy et al., 2015; Hamdan, 2014a). A number of studies in the same context also indicated that students' achievement was found to be better in blended learning environments over traditional learning environments, and even over the e-learning environments (e.g., Al-Qahtani & Higgins, 2013; AlMahamoud & Elebiary, 2013; Alseweed, 2013; Riad, Saadat, & Badawy, 2013). These indicators to the benefits of active learning in blended learning environments are likely to be a justifiable reason for the significantly higher achievement of the experimental group students over their counterparts in the present study.

LIMITATION AND FUTURE DIRECTIONS

The scope of this study was limited to undergraduate students at a single university due to the accessibility and time issues. In addition, the high workload prevented the academic staff in the present study to engage with the students in the online discussion. Accordingly, academic staff involvement in ODFs clearly needs to be investigated, not only because that did not happen in the present study and apparently in previous studies in the Saudi higher education context, but also due to the crucial role they play in ODFs (Al-Fahad, 2010; AlJeraisy et al., 2015; An, Shin, & Lim, 2009; Andresen, 2009; Hew & Cheung, 2010; Pena-Shaff et al., 2005; Sebastianelli, Swift, & Tamimi, 2015; Swan, 2001). Additionally, it seems that there is more to student engagement in ODFs than simply their participation. That is the quality of participation in ODFs. Naranjo, Onrubia, and Segués (2012) have argued that participation "is a necessary but not a sufficient condition for maintaining high-quality contributions throughout the discussion" (p. 282). Student participation can vary widely from very shallow postings to deeply reflective postings on the topics under discussion (Warren, 2008). The quality of student participation in ODFs is well documented (see e.g. Akyol & Garrison, 2011; Hew & Cheung, 2010; Linjawi, Walmsley, & Hill, 2012; Lloyd, 2011; Naranjo et al., 2012), but it seems that there is a scarcity of studies on this area in the Saudi higher education context. Thus, further studies to investigate the quality of student participation in ODFs are required within the Saudi higher education context. Finally, the assessment issue was not considered as it is beyond the scope of this study. Students' participations were relatively low (see Table 1.3) which might be due to the voluntary bases of participation. The importance of assessing student participation in ODFs in the Saudi higher education context is well recognised (Al-Ibrahim & Al-Khalifa, 2014; Al-Ismaiel, 2013; Al-Jarf, 2005a, 2005b; Alghamdi, 2013; Alkhalaf, Nguyen, Nguyen, & Drew, 2011, 2013). Thus, further research is

needed in order to explore the influence of both the voluntary and assessed bases of student participation in ODFs.

CONCLUSION

The findings of the achievement tests and the quantitative data of student participation in ODFs suggest that using ODFs to enhance traditional learning may contribute to students' achievement, particularly when students are engaged in ODFs effectively and efficiently. This is possibly because using ODFs can allow students to participate equally, work socially and collaboratively, and engage in active learning. However, contextual dimensions need to be given a great deal of attention, because they can play a key role in determining the effect of using ODFs on students' achievement (Hartnett, 2012).

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The Impact of Control Belief and Learning Disorientation on Cognitive Load: The Mediating Effect of Academic Emotions in Two Types of Hypermedia Learning Environments

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ABSTRACT
The present study tested the influence of control belief, learning disorientation, and academic emotions on cognitive load in two types of concept-map structures within hypermedia learning environment. Four hundred and eighty-five students were randomly assigned to two groups: 245 students in the hierarchical group and 240 students in the networked group. Multi-group invariance and mediation analysis were applied to test the mediating effects of academic emotions in the association between control belief, learning disorientation and cognitive load (extraneous, intrinsic, and germane load) across groups. Results indicated all models were invariant across the groups. Control belief and learning disorientation were antecedents of positive and negative emotions; extraneous load in turn was affected by positive and negative emotions, whereas intrinsic and germane loads were only influenced by positive emotions. Learning disorientation had positive effect on extraneous load, whereas control belief had positive affect on intrinsic and germane load. The results are discussed in light of the integration of learning disorientation and non-cognitive factors with cognitive load.

Keywords: Control belief, learning disorientation, academic emotions, cognitive load, hypermedia learning environment

INTRODUCTION
Recent research highlights the importance of investigating the contributions of emotions and motivation to the complex phenomenon of cognitive load (Mayer & Estrella, 2014). The roles of emotions on cognitive load in multimedia environments have been examined by applying the emotional design, defined as the use of different design features to influence emotions. For example, the results of a study indicated that the emotional design induced positive emotions, reduced task difficulty and increased performance, but did not significantly affected cognitive load (Plass, Heidig, Heyward, Homer, & Um, 2014). Another study using emotional design showed that participants who experienced the induction of positive emotions and learned using the positive design had longer fixation—that is, more sustained attention to multimedia—than participants who experienced the induction of positive emotions but learned using the negative design, and participants who experienced the induction of negative emotions and learned using the positive or negative design; the emotional design was not significantly affect cognitive load, situational interest, and task difficulty (Park, Knorzer, Plass, Brünken, 2015).

These findings are in contrast with the results of research in an English language class context which showed that anxiety increased cognitive load (Chen & Chang, 2014). However, studies to date have not examined specific types of cognitive load. Thus the question, "How do academic emotions affect specific types of cognitive load?" is still underspecified. Addressing this question, the present study tests the mediational role of academic emotions on extraneous, intrinsic, and germane cognitive loads. Control belief and learning disorientation are considered as antecedents of academic emotions, because control belief is an appraisal property of academic emotions (Pekrun, 2006), and learning disorientation is a well-known problem in the hypermedia (Dias, Gomes, & Correia, 1999). This model was tested in two types of concept-map structures within hypermedia environment: hierarchical and networked.

Direct Effect of Control Belief and Learning Disorientation on Cognitive Load
Control belief, which can be defined as a belief that efforts will result in positive outcomes (Pintrich, Smith, Garcia, & McKeachie, 1991), has a direct influence on cognitive performance. A pilot study showed that self-

efficacy was associated with cognitive load in term of a better working memory performance (Vasile, Marhan, Singer, & Stoicescu, 2011). The other study showed that self-efficacy increased problem solving and efficiency, but had limited effect on time (Hoffman & Schraw, 2009). Since self-efficacy is related to control belief (You & Kang, 2014), those findings support the prediction of control belief to enhance working memory performance through the use of cognitive strategies. You and Kang (2014) showed that control belief positively predicted the use of self-regulated learning strategies.

Learning disorientation is defined as the tendency to lose one's sense of location and direction in a nonlinear document (Ahuja & Webster, 2001). The influence of learning disorientation on cognitive load was demonstrated in previous research showing that learning disorientation positively predicted cognitive load (Amadeu, Tricot, & Marine, 2009). Furthermore, the authors analyzed that learning disorientation was a source of extraneous load, but their analysis lacked empirical supported. Accordingly, the current study aimed at clarifying the direct effect of learning disorientation on specific types of cognitive load.

In the current study, cognitive load is defined as the number of element information which needs to be processed in working memory before commencing meaningful learning (Paas, vanGog, & Sweller, 2010). Most studies consider three types of cognitive load: extraneous load, which is caused by the presentation of irrelevant information during the learning task; intrinsic load, which concerns the complexity of interactivity among elements inherent in the information; and germane load, which refers to the efforts of processing and creating new information (Sweller, 2010). To optimize learning performance, the instruction should reduce extraneous load, manage intrinsic load and promote germane load (Sweller, Ayres, & Kalyuga, 2011). In the hypermedia learning environment, extraneous load comes from the complexity of hypermedia design, whereas intrinsic load relates to the complexity of hypermedia contents and learning tasks.

Academic Emotions as Mediators between Control Belief, Learning Disorientation and Cognitive Load

Academic emotions are thought to be mediating constructs that link control belief and learning disorientation with cognitive performance. This notion is supported by the social-cognitive control-value theory of academic emotions (Pekrun, 2006) and the cognitive-affective theory of learning with media (CATLM) (Moreno, 2006). The control-value theory of academic emotions postulates that control belief has an appraisal function of academic emotions (Pekrun, 2006). When students judge themselves to have high control over environmental factors, positive emotions will be experienced. The reverse is also true: when students have low control, they will experience negative emotions. The CATLM proposes the affective mediation assumption which suggests that motivational and emotional factors mediate learning by increasing or decreasing cognitive engagement (Moreno, 2006), including cognitive load. Reeve, Bonaccio and Winford (2014) made a conclusion based on their study that positive emotions facilitate cognitive performance through decreasing distraction, but negative emotion hinder cognitive performance through increasing distraction. Although learning disorientation is not accounted in the academic emotions theory, the study demonstrated that learning disorientation had a huge impact on emotions (Tan & Wei, 2006).

Previous studies have supported the mediating role of academic emotion between perceived control and learning disorientation with cognitive load. The studies have found that, in classical and online learning contexts, students who had high control belief led to increase in positive emotions and a decrease in negative emotions (Bieg, Goetz, Hubbard, 2013; Lichtenfeld, Pekrun, & Stupnisky, Reiss, & Murayama, 2012; You & Kang, 2014). Learning disorientation also has influence on academic emotions. Users felt interested when they experienced less of a feeling of being "lost" while visiting the web (Tan & Wei, 206), so that their learning effort increase (Shih, Huang, Hsu, & Chen, 2012).

Studies on the effects of emotions on cognitive performance show inconsistent results. Therefore, there are two opposing hypotheses regarding the impact of emotions on learning, namely the emotions-as-facilitator-of-learning hypothesis, which assumes that emotions enhance the learning process, and the emotions-as-suppressor-of-learning hypothesis which postulates that emotions interfere with the learning process (Park, et al, 2015). Supporting the first hypothesis, a study showed that hope positively predicted learning strategies in online and traditional learning (2009). The hindering effects of emotions on cognition and learning are discussed in cognitive load theory. In line with the second hypothesis, Chen and Chang (2009) showed that anxiety positively predicted cognitive load in English listening performance.

Concept-Map Structure as Navigation System of Hypermedia Environment

The concept-map structure is a graphical representation of the conceptual organization of an area of knowledge that is used to assist users to make a series of selections as they go through a complex document (Rouet & Potelle, 2005). The structure of a concept-map can be hierarchical or networked. In hierarchical concept-map,

information is organized in a folder structure which consists of subfolders and looks in a tree-like structure. However, the folder and subfolder information in networked concept-map are organized at same level in a spider web-like structure. The hierarchical concept-map structure is more "linier" or logic than networked structure (Amadieu, Tricot, & Marine, 2009a).

For users, a concept-map is useful to develop a mental organization of information. The impacts of the concept-map as a navigation system on learning disorientation and performance are inconsistent. For example, Congos and Altun (2012) showed no significant difference between the effects of hypertext structure in hierarchical versus networked concept-map on disorientation. In contrast, Amadieu, Tricot, and Marine (2009b) found that participants from a networked group experienced a higher level of disorientation than participants from a hierarchical group. Those contrast findings indicate that hierarchical and networked concept-map structures are different environment. Therefore to generalize the model for predicting all types of cognitive load, the influences of control belief, learning disorientation, and emotions on specific types of cognitive load were examined across hierarchical and networked concept-map structures.

Purposes of the Study and Hypothesis

The purposes of present study were, first, to explore the prediction of control belief, learning disorientation, and academic emotions on specific types of cognitive load under two concept-map structure groups and, secondly, to explore the mediated effect of control belief and learning disorientation on extraneous, intrinsic, and germane load through academic emotions. Accordingly, hypotheses in the present study were organized as antecedents, consequences, direct effects and indirect effects.

Regarding the antecedents of academic emotions, the results were predicted that, in the hypermedia learning environment, control belief would positively predict positive emotions, but negatively predict negative emotions (H1a); and, learning disorientation would positively predict negative emotions, but negatively predict positive emotions (H1b). The consequences of academic emotions on cognitive load can be predicted that positive emotions would negatively predict extraneous load, but positively predict intrinsic and germane load (H2a); and, negative emotions would positively predict extraneous load, but negatively predict intrinsic and germane (H2b).

Concerning the direct effects of control belief and learning disorientation on cognitive load in the hypermedia learning environment, it is predicted that control belief would positively predict intrinsic and germane load, but negatively predict extraneous load (H3a); and, learning disorientation would only positively predict extraneous load (H3b). The mediated effect of academic emotions were predicted that control belief would affect extraneous load negatively, but affect intrinsic and germane load positively via positive emotions (H4a); control belief would affect extraneous load negatively, but affect intrinsic and germane load positively via negative emotions (H4b); learning disorientation would affect extraneous load positively, but affect intrinsic and germane load negatively via positive emotions (H4c); and, learning disorientation would affect extraneous load positively, but affect intrinsic and germane load negatively via negative emotions (H4d).

METHODS

Participants

Four hundred and eighty-five undergraduate students (77 males and 408 females) with an age range of 16 to 23 years (M = 18.66, SD = 0.98) were recruited on a voluntary basis to participate in the experiment. Before the experiment started, participants were assembled at Elementary Teacher Department's auditorium to collect their informed consent. All participants received a set of souvenirs for their participation. The participants were then randomly assigned to one of the two concept-map structures within hypermedia learning environment, i.e. hierarchical (245 students) and networked (240 students) groups.

Measurements

Control beliefs

To assess participants' control belief, the control of learning beliefs subscale from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, et al., 1991) was applied. It consists of 4 items ("If I study in appropriate ways, then I will be able to learn the material in hypermedia") with an 8-point scale from *not at all true of me* (0) to *very true of me* (7). The subscale is designed to assess control belief in classical learning context, then the phrase of 'in this course' is substituted to 'in hypermedia'. The Cronbach's alpha in the present study was .76.

Learning disorientation

The Perceived Disorientation Scale from Ahuja and Webster (2001) was applied to assess participants' learning disorientation in hypermedia learning environment. The scale consists of 7 items ("I felt lost") with an 8-point

scale from *not at all true of me* (0) to *very true of me* (7). The Cronbach's alpha in the present study was .89.

Emotions
Participants' emotions were assessed using the Computer Emotions Scale from Kay and Loverock (2008) which has a total of 12 items with a 4-point scale, ranging from *none of the time* (0) to *all of the time* (3). The scale was applied to assess happiness (3 items) as an indicator of positive emotions, whereas sadness (2 items), anxiety (4 items) and anger (3 items) were used as indicators of negative emotions. The scale began with a general statement ("In general, when I am learning in hypermedia environment, I feel …"). Then the emotion items such as "Satisfied" were presented. The alpha coefficients in the present study were .56 for positive emotions and .85 for negative emotions. The positive emotions produced low reliability estimation because they consist of a few item (Kay & Loverock, 2008).

Cognitive load
The cognitive load was assessed using the Cognitive Load Questionnaire from Leppink, Paas, vanGog, Vleuten, and Merrienboer (2014). It consists of 13 items with an 11-point scale from *not at all the case* (0) to *completely the case* (10). The first four items measure intrinsic load ("The content of hypermedia was very complex"), the next four items assess extraneous load ("The explanations and instructions in hypermedia were very unclear") and the last five items assess germane load ("Learning with hypermedia really enhanced my understanding of the content that was covered"). The Cognitive Load Questionnaire is designed for university students and tested in classical learning context, then modification was performed by changing the phrase 'this activity' to 'hypermedia'. The alpha coefficients in the present study were .83, .89 and .81 for intrinsic, extraneous, and germane load subscales.

All scales were administered computer-based and presented in Bahasa Indonesian. Two Indonesian-English interpreter were involved in back-translation process. The first interpreter translated all scales from English to Bahasa Indonesian, then the second interpreter translated the Indonesian version of the scales to English. The discrepancies of the back-translation results were discussed and adjusted to the Bahasa Indonesian translation. The factor loading, reliability, and average variance extracted were presented at appendix.

Procedures
The experiment was conducted in four steps in group sessions for 20-30 minutes, including assessment, and involved 8-12 persons per session. First, participants were given overview of the study procedures, and were briefed about the rules of the experiment, such as the prohibition against conversations, making phone calls, and opening other computer programs. Secondly, they were asked to register as new participants by answering the demographic questions and creating a username and a password. Thirdly, they were permitted to study the hypermedia materials. In this step, participants were divided into two group, namely hierarchical and networked group. Participants from hierarchical group studied the hypermedia contents through hierarchical concept-map navigation system (see Fig 1.a), whereas participants from networked group studied hypermedia contents through networked concept-map navigation system (see Fig 1.b). Although the navigation system were different across groups, but the hypermedia contents were same for both group. Before exploring the learning material, participants were required to read the learning objectives as shown in the left-bottom corner of the navigation page. Participants had enough time to study the hypermedia content, but they generally spent about 20-25 minutes to study the hypermedia contents. The learning period ended when participants pressed the 'Responding Scale' icon. Finally, participants' control belief, learning disorientation, emotions, and cognitive load were assessed.

The sessions of experiment were conducted in a computer laboratory equipped with 33 multimedia desktop PCs with intranet and internet connections. Participants studied the hypermedia contents and responded to the scale using 17 inch monitors.

Materials
The researchers developed hypermedia learning materials with the topic of "Circulatory System" which were adopted from Microsoft Encarta Multimedia Encyclopedia (Setaro, 2008). As seen in Fig 1, there are two versions of the navigation systems for hypermedia learning materials that were developed according to Amadeu et al (2009a). They are hierarchical (Fig 1.a) and networked (Fig 1.b) concept-map structures of navigation systems. Following the concept-map structure from Amadeu et al (2009a), in the hierarchical concept-map structure, the hypermedia contents were organized in subordinate and superordinate relations of concepts (horizontal organization) as well as sequence of events (vertical organization); whereas in the networked concept-map structure, the hypermedia contents were organized in relational (i.e., they displayed relations such as causes, follows, shares elements, but the links were not labelled as such). The contents, concept titles and text

sections were the same in the two conditions. The original version of Encarta Multimedia Encyclopedia was in English. It was then translated into Bahasa Indonesian. The hypermedia materials consisted of 14 nodes with 1 title box, 2793 Indonesian words, 1 animation video and 7 pictures.

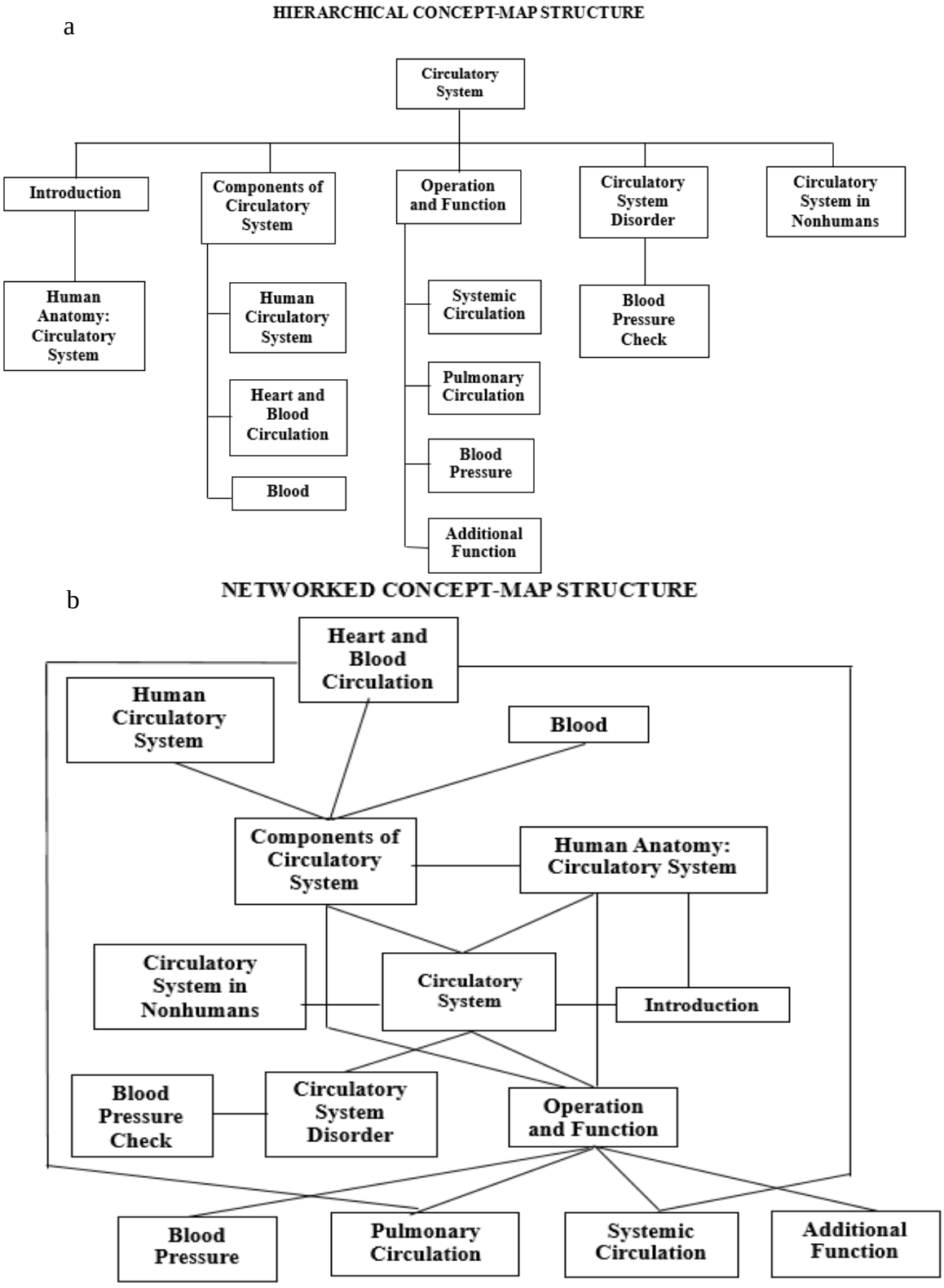


Fig 1. Hierarchical (a) and Networked (b) Concept-map Navigation System.
(Adapted from Amadeu, Tricot, & Mariné, 2009a)

RESULTS

Descriptive data

Table 1 presented the intercorrelation metric, mean and standard deviation for hierarchical and networked groups. Measures of control belief and learning disorientation were correlated with positive and negative emotions; control belief had a positive correlation with positive emotions, while learning disorientation had a negative correlation with positive emotions, but had a positive correlation with negative emotions. Positive emotions negatively correlated with extraneous load, but positively correlated with intrinsic and germane load, whereas negative emotion only positively correlated with extraneous load. Measures of control belief and learning disorientation were intercorrelated with three measures of cognitive load. Control belief positively correlated with intrinsic and germane load, but negatively correlated with extraneous load. Learning disorientation only had a positive correlation with extraneous load. The correlation directions for both hierarchical and networked groups were consistent, except the intercorrelation between control belief and extraneous load which only exists in networked group.

Table 1. Mean, Standard Deviation, and Inter-Correlation Matric of Control Belief, Learning Disorientation, Emotion, and Cognitive Load.

	LD	CLB	PE	NE	iCL	eCL	gCL
LD		.002	.20**	.58***	-.01	.43***	-.07
CLB	-.01		.40***	-.06	.30***	-.07	.50***
PE	-.139*	.41***		-.18**	.24***	-.26***	-.47***
NE	.56***	-.06	-.18**		-.02	.44***	-.12
iCL	.06	.19**	.22**	.01		.08	.50***
eCL	.42***	-.14*	-.23***	.53***	.07		-.03
gCL	-.06	.35***	.44***	-.08	.40**	-.10	
Hierarchical- ***M(SD)***	.88 (1.00)	4.87 (1.42)	2.14 (.63)	.33 (.40)	2.43 (.60)	.92 (.74)	3.19 (.73)
Networked- ***M(SD)***	1.05 (1.15)	4.92 (1.30)	2.25 (.48)	.31 (.35)	2.48 (.69)	.88 (.72)	3.23 (.70)

Note: Intercorrelations for hierarchical group (n = 245) are presented above the diagonal, and intercorrelations for networked group (n = 240) are presented below the diagonal. CLB = control belief; LD = learning disorientation; PE = positive emotion; NE = negative emotions; CL = cognitive load; * < .05; ** < .01; *** < .001

Model for Predicting Extraneous, Intrinsic and Germane Load

The models for predicting cognitive load were examined under two different concept-map structures, namely hierarchical and networked. Therefore, the multi-group invariance test was applied with a purpose to test the generalizability of the model for predicting extraneous, intrinsic and germane load across groups. The multi-group invariance test was performed in four steps following Vandenberg and Lance (2000). Data analysis was formed with AMOS version 21(IBM Corp., 2012).

Invariant model across two navigations systems

The summary results of invariance test of all models are presented in Table 2. The configural invariance metric of the model for predicting extraneous load yielded an acceptable fit (χ^2 (622) = 1185.04; χ^2/df = 1.91; CFI = .90; SRMR = .07; RMSEA (90% CI) = .04 (.04, .05)). This result indicates that the structure pattern of the model for predicting extraneous load is equal across the two navigation system groups. Because the full metric invariance test produced a χ^2 difference value of 36.68 with a degrees of freedom value of 19 and significance level at $p <$ .05, the full metric invariance model was rejected. To identify those indicators that had variant factor loadings, a method suggested by Byrne (2010) was implemented. The result showed that the factor loading of item number 5 of Perceived Disorientation Scale (a7) was the source of a significant increase in the $\Delta\chi^2$ value. Relaxing the constraint of a7 produced the χ^2 difference of 25.79 with 18 degrees of freedom, which was not statistically significant at $p >$ .05; hence, the partial metric invariance model was accepted. The full scalar invariance test yielded the χ^2 difference of 33.20 with 27 degrees of freedom and was statistically not significant at $p >$ .05; hence, the full scalar invariance was supported. Because the full factor invariance test produced a statistically insignificant difference of χ^2 ($\Delta\chi^2$ = 11.28, Δdf = 8, $p >$ .05), the factor invariance was accepted. In conclusion, the model for predicting extraneous load can be generalized across hierarchical and networked groups.

Table 2. Fit Indices for Invariant Test and χ^2 Difference Tests of Extraneous Load Model.

Test	χ^2	df	*p*	χ^2/df	CFI	SRMR	RMSEA (90% CI)	Comparative Model	$\Delta\chi^2$	Δdf	*p*	ΔCFI	Decision
Model for predicting extraneous load													
Configural invariance (Model 1)	1185.04	622	.00	1.91	.90	.07	.04 (.04, .05)	-	-	-	-	-	-
Full metric invariance (Model 2)	1221.72	641	.00	1.91	.90	.08	.04 (.04, .05)	1 – 2	36.68	19	.01	.00	Reject
Partial metric invariance (Model 3) *(a7 free)*	1210.83	640	.00	1.89	.90	.07	.04 (.04, .05)	1 – 3	25.79	18	.11	.00	Accept
Full scalar invariance (Model 4)	1244.03	667	.00	1.87	.90	.07	.04 (.04, .05)	3 – 4	33.20	27	.19	.00	Accept
Full factor invariance (Model 5)	1255.31	675	.00	1.86	.90	.08	.04 (.04, .05)	4 – 5	11.28	8	.19	.00	Accept
Model for predicting intrinsic load													
Configural invariance (Model 1)	1130.11	616	.00	1.84	.91	.08	.04 (.04, .05)	-	-	-	-	-	-
Full metric invariance (Model 2)	1161.42	635	.00	1.83	.90	.08	.04 (.04, .05)	1 – 2	31.31	19	.04	.00	Reject
Partial metric invariance (Model 3) *(a10 free)*	1156.91	634	.00	1.83	.90	.08	.04 (.04, .05)	1 – 3	26.80	18	.08	.00	Accept
Full scalar invariance (Model 4)	1188.86	661	.00	1.80	.90	.08	04 (.04, .04)	3 – 4	31.95	27	.23	.00	Accept
Full factor invariance (Model 5)	1195.30	668	.00	1.79	.90	.08	.04 (.04, .04)	4 – 5	6.45	7	.49	.00	Accept
Model for predicting germane load													
Configural invariance (Model 1)	1274.63	664	.00	1.92	.90	.08	.04 (.04, .05)	-	-	-	-	-	-
Full metric invariance (Model 2)	1314.34	683	.00	1.92	.90	.08	.04 (.04, .05)	1 – 2	39.71	19	.00	.00	Reject
Partial metric invariance (Model 3) *(a6, a10 and a18 free)*	1298.39	680	.00	1.91	.90	.08	.04 (.04, .05)	1 – 3	24.01	16	.09	.00	Accept
Full scalar invariance (Model 4)	1332.39	708	.00	1.88	.90	.08	.04 (.04, .05)	3 – 4	33.75	28	.21	.00	Accept
Full factor invariance (Model 5)	1345.82	716	.00	1.88	.90	.08	.04 (.04, .05)	4 – 5	13.43	8	.10	.00	Accept

Configural invariance (structure pattern equal); metric invariance (factor loading equal); scalar invariance (item intercept equal); factor variance invariance (structural path equal)

As seen in Table 2, the configural invariance test of the model for predicting intrinsic load yielded an acceptable fit (χ^2 (616) = 1130.11; χ^2/df = 1.84; CFI = .91; SRMR = .08; RMSEA (90% CI) = .04 (.04, .05)). However, the full metric invariance test was not supported ($\Delta\chi^2$ = 31.31, Δdf = 19, p < .05). Relaxing the constraints item number 5 of the Computer Emotions Scale (a10) produced an acceptable partial metric invariance model ($\Delta\chi^2$ = 26.80, Δdf = 18, p > .05). The full scalar metric invariance model was also accepted ($\Delta\chi^2$ = 31.95, Δdf = 27, p > .05). The full factor invariance tests also showed an acceptable result ($\Delta\chi^2$ = 6.45, Δdf = 7, p > .05). Thus, the results of multi-group invariance test showed that the model for predicting intrinsic load can be generalized across hierarchical and networked groups.

The result of the configural invariance test showed that the model for predicting germane load had acceptable fit (χ^2 (664) = 1274.63; χ^2/df = 1.92; CFI = .90; SRMR = .08; RMSEA (90% CI) = .04 (.04, .05)). The full metric invariance test was not supported ($\Delta\chi^2$ = 39.71, Δdf = 19, p < .01). Relaxing the constraints item number 4 of the Perceived Disorientation Scale (a6), item number 5 of the Computer Emotions Scale (a10), and item number 11 of Cognitive Load Scale (a18) yielded a non-significant difference of χ^2 ($\Delta\chi^2$ = 24.01, Δdf = 16, p > .05). The full scalar invariance test supported invariance across groups ($\Delta\chi^2$ = 33.75, Δdf = 28, p > .05). The full factor invariance test was also supported ($\Delta\chi^2$ = 13.43, Δdf = 8, p > .05). These results showed that the model for predicting germane load can be generalized across hierarchical and networked navigation system groups.

The structural model for predicting extraneous, intrinsic and germane load

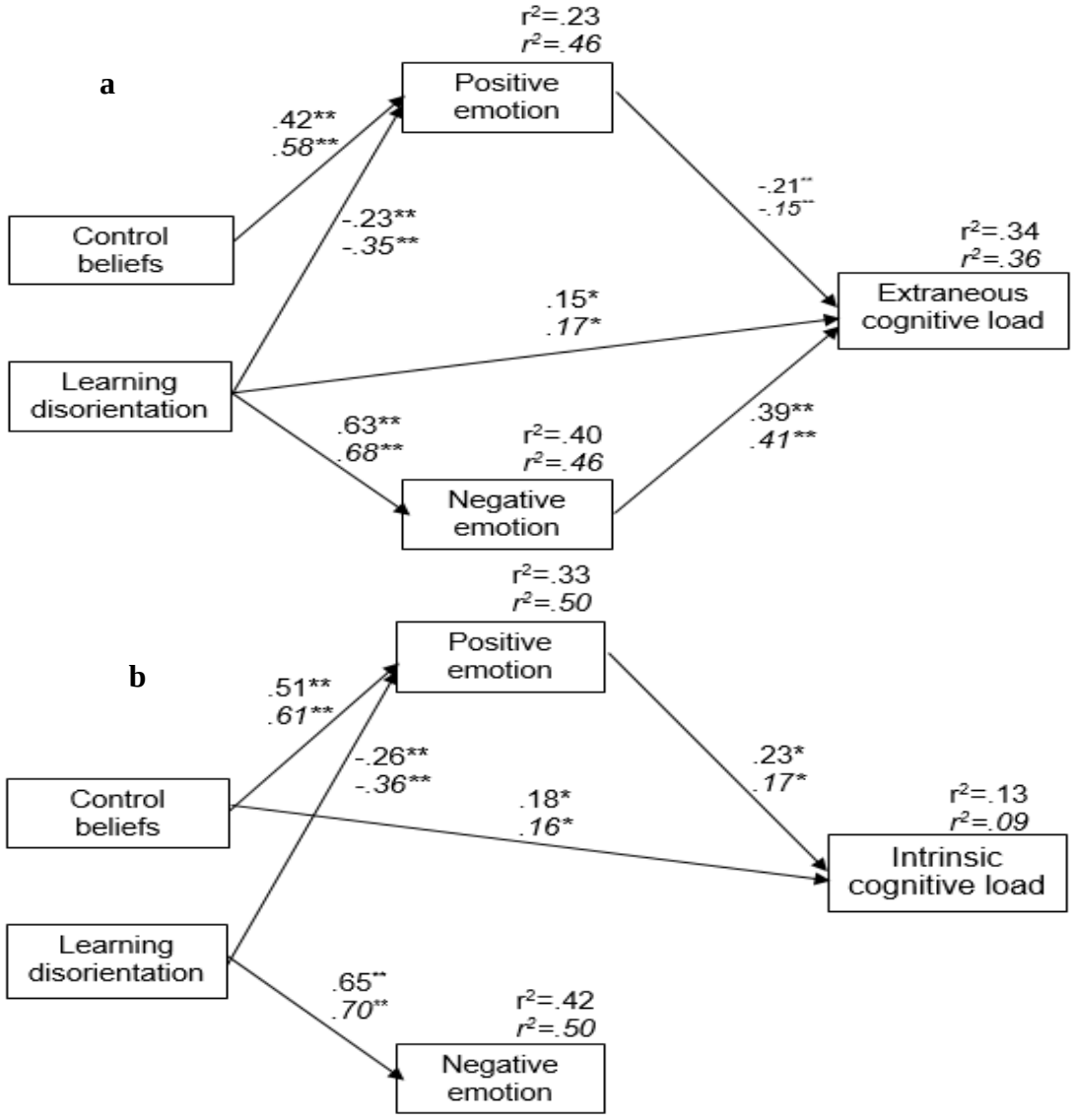
The models for predicting extraneous, intrinsic, and germane load are presented in Figs 2a, 2b, and 2c respectively. For all models, control belief consistently predicted positive emotions (hierarchical: $\beta_{extraneous}$ = .42, $\beta_{intrinsic}$ =.51, and $\beta_{germane}$ =.55, p < .01; networked: $\beta_{extraneous}$ = .58, $\beta_{intrinsic}$ =.61, and $\beta_{germane}$ =.60, p < .01), but predicted negative emotions only in the model for predicting germane load (β = -.12 and -.11, p < .05, for hierarchical and networked group respectively). Learning disorientation consistently had a positive association with negative emotions (hierarchical: $\beta_{extraneous}$ = .63, $\beta_{intrinsic}$ = .65, and $\beta_{germane}$ =.64, p < .01; networked: $\beta_{extraneous}$ = .68, $\beta_{intrinisc}$ = .70, and $\beta_{germane}$ =.69, p < .01) and a negative association with positive emotions (hierarchical: $\beta_{extraneous}$ = -.23, $\beta_{intrinisc}$ = -.26, and $\beta_{germane}$ = -.22, p < .05; networked: $\beta_{extraneous}$ = -.35, $\beta_{intrinisc}$ =-.36, and $\beta_{germane}$ =-.28, p < .01).

Both positive and negative emotions predicted extraneous, intrinsic, and germane load. Particularly, positive emotions appeared to lead to decreased extraneous load, but increased intrinsic and germane loads (hierarchical: $\beta_{extraneous}$ = -.21, $\beta_{intrinsic}$ = .23, and $\beta_{germane}$ = .46, p < .01; networked: $\beta_{extraneous}$ = -.15, $\beta_{intrinsic}$ = .17, and $\beta_{germane}$ =

.39, $p < .01$). However, negative emotions only predicted greater extraneous load (β = .39 and .41, $p < .01$, for hierarchical and networked group respectively).

Taking these findings as whole, the predictions of antecedents and consequences of academic emotions in hypermedia learning environments were mostly supported. As predicted in Hypothesis 1b and 2a, learning disorientation affected both positive and negative emotions. Then positive emotions had consequences on extraneous, intrinsic and germane loads. However, the findings that control belief predicted negative emotions only in the model for predicting germane load, and negative emotions only positively affected extraneous load provided only partial support for Hypothesis 1a and 2b.

Control belief and learning disorientation also had direct effects on extraneous, intrinsic and germane load (Fig 2a, 2b, and 2c). In particular, control belief positively predicted intrinsic and germane load (hierarchical: $\beta_{intrinsic}$ = .18, $p < .05$ and $\beta_{germane}$ = .28, $p < .01$; networked: $\beta_{intrinsic}$ = .16, $p < .05$ and $\beta_{germane}$ = .26, $p < .01$), but insignificantly predicted extraneous load. These findings partly verified Hypothesis 3a. Hypothesis 3b was also supported because learning disorientation positively predicted extraneous load in both the hierarchical and networked groups (β = .15 and .17, $p < .05$, respectively).



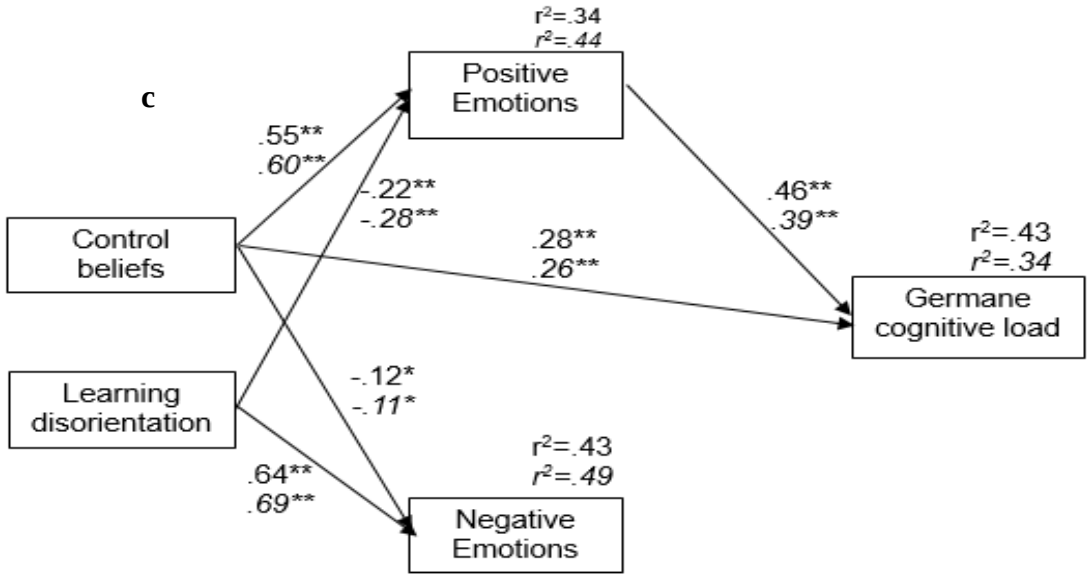


Fig 2. Invariant Model for Predicting Extraneous (a), Intrinsic (b) and Germane Cognitive Load (c) between Hierarchical and Networked Navigation System.

Note: Normal font of values (xx)= estimations of hierarchical group; Italic font of values (*xx*)= estimations of networked group; * $p < .05$; ** $p < .01$.

The Mediating Effects of Control Belief and Learning Disorientation on Cognitive Load through Academic Emotions

Due to the results of the multi-group invariance test showing that all the models were invariant across the hierarchical and networked groups, the mediation analysis was performed with all participants as a single group. The mediation analysis was performed by using bias-corrected bootstrapping to generate confidence intervals (Preacher & Hayes, 2008). The bootstrapping sampling (n = 2000) distributions of the indirect effects are produced by calculating the indirect effects in the samples. The indirect effects are estimated by using point estimates and confidence intervals (95%). The summary results of mediated analysis are presented in Table 3.

Table 3. Bootstrapped Conditional Indirect Effects of Control Belief and Learning Disorientation on All Type of Cognitive Load via Academic Emotions.

Predicted mediated effect	Observed mediated effects				
	Estimate	SE	BC 95%		
			Lower	Upper	*p*
Model for predicting extraneous load					
CB➔PE➔eCL	-.13	.06	-.27	-.02	.01
LD➔PE➔eCL	.09	.05	.02	.20	.01
LD➔NE➔eCL	.34	.15	.08	.68	.01
Model for predicting intrinsic load					
CB➔PE➔iCL	.19	.08	.06	.37	.01
LD➔PE➔iCL	-.09	.04	-.18	-.02	.01
Model for predicting germane load					
CB➔PE➔gCL	.31	.08	.18	.52	.00
LD➔PE➔gCL	-.14	.04	-.24	-.06	.00

CB: control belief; LD: learning disorientation; PE: positive emotion; NE: negative emotion; eCL: extraneous load; iCL: intrinsic load; gCL: germane load; BC = Bias-corrected of percentile point; SE = Standard Error

In the model for predicting extraneous load, control belief had a negative indirect effect on extraneous load via positive emotion ($\beta = -.13$, $p < .01$). There were positive indirect effects of learning disorientation on extraneous load via positive emotions ($\beta = .09$, $p < .01$) and negative emotions ($\beta = .34$, $p < .01$). Control belief and learning disorientation also had indirect effects on intrinsic and germane load. Particularly, control belief indirectly influenced intrinsic ($\beta = .19$, $p < .01$) and germane load ($\beta = .31$, $p < .00$) positively via positive emotions. Learning disorientation had a negative indirect effect on intrinsic ($\beta = -.09$, $p < .01$) and germane load ($\beta = -.14$, $p < .00$) via positive emotions. The results of mediated analysis were consistent with Hypotheses 4a and 4c, but partly supported Hypothesis 4d. Hypothesis 4b was rejected.

DISCUSSION

The association between emotions and cognitive load has been identified by Bergren, Koster, and Darakhsan (2012), Chen and Chang (2009), and Qi et al (2014). However, those studies only measured cognitive load as a single construct, they are unable to explain the effects of emotions on specific types of cognitive load. The current study found that positive and negative emotions had consequences on cognitive load. Specifically, positive emotions were associated with lower extraneous load and higher intrinsic and germane load, whereas negative emotions were associated with the higher extraneous load. Hence, the results in the present study on positive and negative emotions and three types of cognitive load are new findings. The findings on emotions and three types of cognitive load further support the analysis that intrinsic and germane cognitive load are qualitatively different from extrinsic cognitive load.

The influence of negative emotions on extraneous load can be explained by attention (Kay & Loverock, 2008) because extraneous load requires working memory capacities for processing irrelevant information. Working memory capacities need to be freed for an optimum processing of emotional information (King & Schaefer, 2010); consequently, task performance declines because working memory capacities are less devoted to processing task information. When students experience negative emotions, they tend to distract and to allocate attention and working memory capacities for processing the sources of emotional information.

Other findings indicate that control belief and positive emotions promote the use of effective strategies for processing the element interactivity of information that is embedded within extraneous, intrinsic and germane load (Sweller, 2010). These results concerning beneficial impacts replicate previous studies (Hoffman & Schraw, 2009; Reeve, Bonaccio, & Winfard, 2014; You & Kang, 2014). The high levels of control belief and positive emotions encourage implementation of effective strategies for processing relevant information in learning tasks. Control belief and positive emotions support selective attention strategies to ignore irrelevant element interactivity when facing high extraneous load. As a consequence, working memory capacity is still large enough to be devoted to handling the element interactivity in learning tasks. Under high intrinsic load, control belief and positive emotions inspire the use of effective strategies to manage the complexity of task information and to devote effective efforts to process the information, so that all element interactivity can be treated as new meaningful information. Under this circumstance, learners manage intrinsic load efficiently and optimize germane load.

The current findings support the cognitive-affective theory of learning with media (CATLM) which proposes a mediator effect of motivation and affective state on attention selection and working memory performance. Further, the indirect effect of positive emotions in the association between learning disorientation and control belief on the one hand and intrinsic and germane load on the other hand justifies the mediating role of academic emotions as outlined in the affective mediation assumption of CATLM. The impact of control belief on working memory performance will be more powerful when involving positive emotions. In contrast, the impact of learning disorientation on extraneous load will increase when involving both positive and negative emotions. Results of the present study clarify the detrimental effect of negative emotions and the valuable impact of positive emotions on working memory load.

Moreover, the findings of the present study also support three aspects of the control-value theory of academic emotions. First, the results of this study maintain the role of control belief as an antecedent for academic emotions. Specifically, the present study showed the positive influence of control belief on positive emotions in all models and the negative impact of control belief on negative emotions in a model for predicting germane load. Second, the findings of present study demonstrate the consequences of emotions on cognitive performance. Finally, the current findings shed light on the mediation role of academic emotions in strengthening the link between control belief and cognitive performance. Hence, the results of the present study support the generalization of the control-value theory of academic emotions in the hypermedia learning environment.

The present study also found that learning disorientation positively predicted extraneous load both in hierarchical and networked navigation systems. This finding supports the analysis by Amadeu et al. (2009a) showing the influence of learning disorientation on extraneous load. Because perceived disorientation is irrelevant to the learning task, learning disorientation becomes a source of extraneous load. Moreover, positive and negative emotions serve to strengthen the interrelation between learning disorientation and extraneous load. These results alert hypermedia designers about the undesirable impact of unmanaged learning disorientation for users' emotions and extraneous load.

The present study did not find any impact of navigations system on the model. In contrast with previous study from Amadeu, Tricot and Marine (2009ab) and Ethier, Hedaya, Talbot and Cadieux (2008), a finding of present

study showed that there is no impact of navigation system on the model for predicting cognitive load. Specifically, present study showed that there is no any path of the model for predicting cognitive load which was moderated by navigation system. This finding reflected that the models for predicting cognitive load had an equal correlation and prediction between hierarchical and networked concept-map structure navigation system. Studies from Amadeu, Tricot and Marine (2009ab) proved that participants with networked navigation system had higher cognitive load that participants with hierarchical navigation system. The study from Ethier, Hedaya, Talbot and Cadieux (2008) found that navigation system had effect on control belief. This finding was not surprisingly because participants of present study had enough time to study the hypermedia content. With sufficient time, participants seemly succeed to adapt, organize, and learn the hypermedia contents as required in learning objectives. As a result, participants from two group of navigation system have same level of cognitive load, emotions, disorientation, and control beliefs.

CONCLUSIONS AND IMPLICATIONS

On the level of theory, the findings of the present study support the affective mediation assumption of CATLM (Moreno, 2006) and the control-value theory of academic emotions (Pekrun, 2006). The present study have succeeded to clarify the impacts of control belief and emotions on intrinsic and germane loads, and the impacts of learning disorientation and emotions on extraneous load. In the previous study, the interrelation between learning disorientation and extraneous load was lack of empirical support (Amadeu, Tricot, & Marine, 2009a). The model for predicting extraneous, intrinsic and germane cognitive load were applicable in both hierarchical and networked navigation system.

The limitation of the present study concerns to the control of participants' expertise and performance. Specifically, the present study was not control the prior knowledge and assess performance. Consequently, present study unable to show the impact of the model for predicting cognitive load on performance. Further study on motivation, learning disorientation, emotions and cognitive load need to assess participants' prior knowledge (Chen, Fan, & Macredie, 2006; Plass, Moreno, & Brunken, 2011). Moreover, present study only involved control belief as a motivational variable and two types of emotions, namely positive and negative emotions. Involving other motivation and affective factors such as self-efficacy, interest and goal orientation would be advantageous for understanding their interference with working memory load in future research.

Practical implications of this study are associated with managing cognitive load. First, the design of the hypermedia environment should lower learning disorientation with the purpose of increasing positive emotions. Secondly, the results suggest the importance of orienting users about the topics and important parts of the hypermedia design before users study hypermedia. Finally, it is important to promote learners' control belief in studying in a hypermedia learning environment.

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Appendix

Factor loading, average variance extracted and reliability

	Factor loading	Avarage Variance Extracted	Reliability
Control Beliefs (CB)			
CB 1	.77	.59	.76
CB 2	.73		
CB 3	.80		
CB 4	.78		
Learning Disorientation (LD)			
LD 1	.78	.60	.87
LD 2	.78		
LD 3	.78		
LD 4	.78		
LD 5	.73		
LD 6	.82		
LD 7	.74		
Emotions			
Happiness (Hap)			
Hap 1	.76	.54	.56
Hap 2	.80		
Hap 3	.65		
Sadness (Sad)*			
Sad 1	.85	.72	.60
Sad 2	.85		
Anxiety (Anx)*			
Anx 1	.75	.54	.71
Anx 2	.72		
Anx 3	.73		
Anx 4	.74		
Anger (Ang)*			
Ang 1	.83	.71	.78
Ang 2	.87		
Ang 3	.82		
Cognitive Load			
Intrinsic cognitive load (ICL)			
ICL 1	.88	.68	.83
ICL 2	.89		
ICL 3	.83		
ICL 4	.68		
Exraneous cognitive load (ECL)			
ECL 1	.89	.76	.89
ECL 2	.90		
ECL 3	.88		
ECL 4	.82		
Germane cognitive load (GCL)			
GCL 1	.87	.68	.81
GCL 2	.91		
GCL 3	.91		
GCL 4	.86		
GCL 5	.54		

* These types of emotions in present study were analyzed as negative emotions which have range of factor loading from .54 to .79, AVE is .47, and reliability is .85

The Potentials of Using Cloud Computing in Schools: A Systematic Literature Review

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ABSTRACT
Cloud Computing (CC) refers to the physical structure of a communications network, where data is stored in large data centers and can be accessed anywhere, at any time, and from different devices. This systematic literature review identifies and categorizes the potential and barriers of cloud-based teaching in schools from an international perspective. This study applied the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology for determining the articles and reporting analysis. A total of 510 articles were identified from ERIC, IEEE Xplore, Science Direct, and Primo. After screening and eligibility checking, 13 articles focusing on "cloud computing and school" were included for qualitative and meta-analysis. The papers are coded, devising 31 themes grouped into five categories. The adoption of CC in schools is associated with five factors: 1) globalization (easier access to education, data access everywhere/accessibility/infrastructure, 21st Century Skills), 2) educational benefits (motivation, teacher-parent communication, collaboration, flexibility, productivity, creativity, self-organized learning, communication, sharing of knowledge, problem-solving, responsible students/peer review/no bad excuses), 3) administrative benefits (economy—operations, computer lifetime, licenses, timesaving, BYOD, software diversity), 4) barriers (technical barriers, cultural barriers, security, privacy, laws and regulations for schools, age restrictions/parent acceptance, and opacity), and 5) implementation (management support, paradigm shift in education, incongruence between implementation strategies).

INTRODUCTION
Information communication technologies (ICTs) have led to a paradigm shift in schools in recent years, influencing teachers' roles, learners' roles, content, and practices (Faroese, 2012). ICT is now an integral part of the daily practice of schools around the globe, with teachers being expected to adopt and integrate ICT into their teaching. The Danish Ministry of Education defines the role of ICT as "collecting, processing, storing, and disseminating information" (EMU Denmark's learning portal, 2015, translated). In recent years, the use of ICT in schools has largely focused on the Internet's potential for collaboration, production, and the reproduction of digital products. Specifically, the adoption of Web 2.0 applications and Cloud Computing (CC) has become an essential factor for modern education.

The concept of Web 2.0 first appeared in the article "Fragmented Future" (DiNucci, 1999), but it was made popular in 2004 by Tim O'Reilly and Dale Dougherty at the Web 2.0 Summit in San Francisco. This concept implies a new approach to the Internet, whereby users work together to create and edit content. Web 2.0 primarily refers to a changed mindset regarding how to use the Internet. On the other hand, CC refers to the physical structure of a communications network, through which data is saved and stored in large data centers and can be accessed anywhere, at any time, and from different devices.

Since 2004, Web 2.0 and CC have made their main entry with services like Wikipedia, Facebook, YouTube, and, later in 2010, with Google Drive, which was a groundbreaking development for its use in education. Jeppe

Bundsgaard (2010) divides digital teaching resources into six categories, with CC fitting into the category of *shell/utility programs*, which are primarily used to produce and store data online. These new Web 2.0 services have revolutionized the way the Internet is used by moving the user from a passive role as the recipient of information to an active role as a player in the content's co-creation. This modified approach to the use of the Internet has spread to schools, where teachers have begun using CC in their teaching. In 2013, 42% of the K-12 schools in the United States were in the process of implementing or already using CC to store data. There was a 15% nationwide increase during the period of 2011 to 2013 (Carahar & Nott, 2013). In Danish schools, many municipalities have chosen to discontinue the use of shared drives in favor of CC. Contrary to this trend, the municipality of Odense, like several municipalities in Sweden, opted not to use Google Drive, as the service did not live up to the municipalities' data processing requirements (Madsen, 2014). It is clear that there are some underlying reasons for the adoption of CC and the discontinuation of alternative ICTs, which can be interpreted as the greater potentials of CC and its functions or values that circumvent or even solve some of the existing challenges posed by other forms of educational technologies.

The objective of this systematic literature review is to identify and categorize the potentials of cloud-based teaching in schools from an international perspective. The underlying research question is: from a globalization perspective, what are the reasons behind the integration and adoption of cloud-based applications in teaching activities of schools?

METHODOLOGY

This section provides an overview of the methodological approach used for the literature selection and the method applied for analysis. This literature review is conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology, which is used to create a systematic, precise, and reliable overview of the literature (Moher, Liberati, Tetzlaff, & Altma, 2009). The process of collecting articles for analysis is guided by a flow-chart that includes four phases, and the process for reporting a literature review includes a 27-step checklist. PRISMA defines a systematic review as "a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review" (Moher, Liberati, Tetzlaff, & Altma, 2009).

This paper reviews the potential of cloud-based applications in schools. Therefore, various combinations of the following keywords were used: cloud, K-12, classroom, benefits, pros, potentials. The search was restricted to peer-reviewed texts and was conducted in English to obtain a global perspective on the topic and avoid too-narrow searches. The search was limited to the period between 2010 and the search date (September 24, 2015). This restriction was implemented because Google Docs, a CC frontrunner in education, went from the beta version to the official in 2010. Furthermore, in 2010, the arrival of iPad revolutionized the development and adoption of could-based educational applications through different platforms. In consultation with a librarian and after testing different combinations of keywords, four databases were selected, and different combinations of the keywords were used. ERIC returned 23 results, IEEE Xplore returned 266, Science Direct returned 171, and Primo returned 50.

Figure 1, the PRISMA flow diagram, shows four phases: "identification," "screening," "eligibility," and "included." The "identification" phase returned 510 results via the four databases. In addition, six texts were included as the result of chain searches, which is where known literature is used as a starting point for finding additional literature related to the topic. In the first part of the "screening" phase, five duplicate articles were removed. Furthermore, 476 texts were excluded because the title, keywords, or abstract did not contain the desired themes. The criteria used to reduce the number of texts were as follows: 1) the text has no connection to schools and 2) the text does not refer to any kind of cloud service.

In the third phase, "eligibility," 35 texts were left, and of these, an additional 22 texts were excluded because they did not contain a sufficient connection between schools and cloud services. In the final phase, "included," there were 13 texts remaining to be included in the quantitative synthesis and analysis.

This study applied a coding technique presented by Tayler-Hewitt (2001). The articles were encoded according to themes and then divided into categories. During this process, the coded sections were regularly compared to similar parts of texts containing the same codes. The intention was to create a connection between the texts and ensure the continuity of the codes' definitions (Strauss & Corbin, 1990; Hewitt-Taylor, 2001).

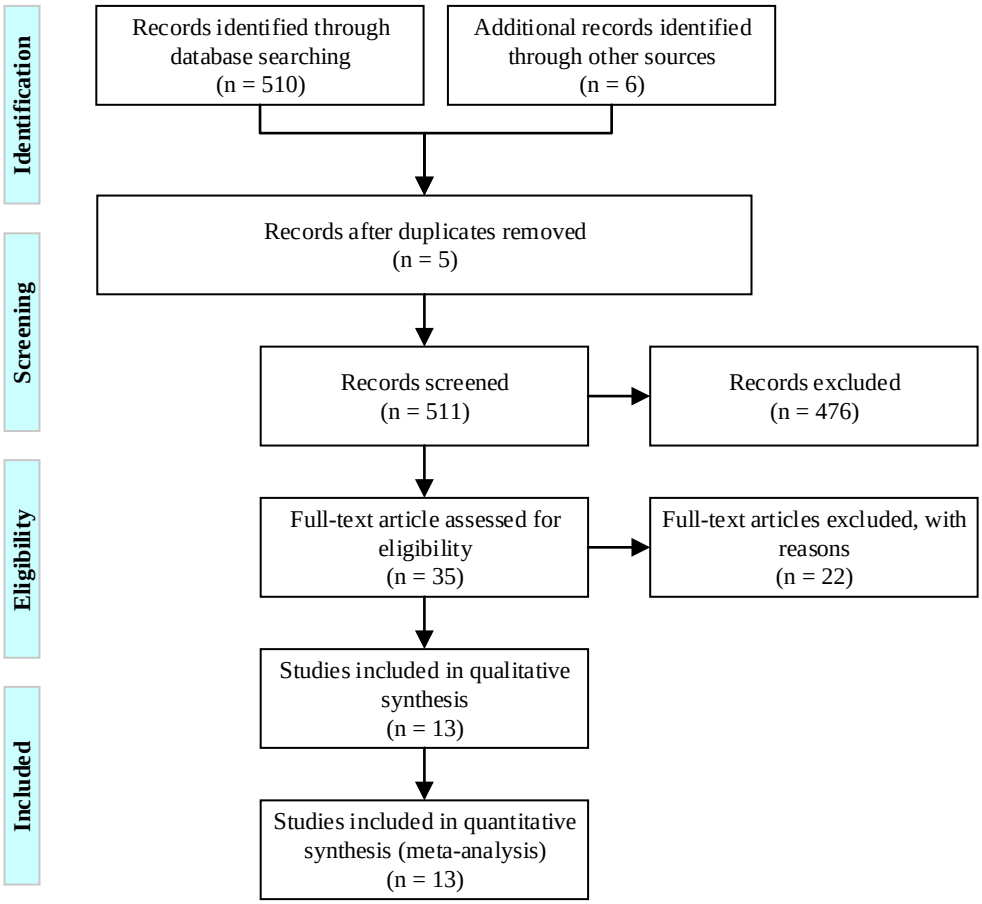

Figure 1. PRISMA Flow-Chart

Globalization in the Context of Education

Globalization in the education context includes a number of intertwined discourses and processes worldwide. Spring (2008) refers to globalization and education as involving discourses concerning knowledge, economy, technology, and lifelong learning. Such factors in a global context influence a variety of practices in a local context. Under the influence of major intergovernmental institutions, such as the OECD, the global education policy forms a so-called "super structure" through various international networks and processes that influence the school system at a national level. The authors also talk about a global super structure, which refers to when multiple nations adopt a political agenda on the basis of a global policy in order to comply with the global economy. For example, Denmark's National Learning Festival, held in September 2015, put a special focus on 21st century skills. These skills were originally formulated by global public and private organizations in 2002 in order to create a learning model that would prepare students and citizens for the new millennium, where the development of these skills would support international competitiveness (P21, 2015). Spring (2008) expands on this by examining the extent to which the world's governments discuss how to invest in training for human capital development for the sake of promoting economic growth, sayng that, "As a consequence, educational discourses around the world often refers to human capital, lifelong learning for improving job skills, and economic development" (Spring, 2008, p. 132). He also accounts for technology's role in this context, explaining that, "Information and communication technology is speeding the global flow of information and creat[ing] a library of world knowledges" (Spring, 2008, p. 132). This paper thereby considers the term globalization as a product of the discourses and trends of international and intergovernmental institutions that influence the national school practice for the sake of developing training and human capital that can promote global competitiveness. At the same time, ICT acts as a generator of this development.

Competence

The term competence can be defined as a complex fusion of knowledge, skills, and abilities, and the use of these in a given context. The European Network KeyCoNet (2012) selected eight key competences that were considered necessary for achieving personal development, active citizenship, and social inclusion in the 21st century. These included digital, social, and civic competences and the skill to communicate in the mother tongue (Looney & Michel, 2014). The educational focus has shifted from teachers' teaching approaches to students'

learning approaches. Additionally, competence is described as the context-oriented skills of a student—namely, the skills that make him or her able to cope in specific situations in real life and capable of working in certain professional fields. Competence is even formulated as concrete learning. For example, the students' ability to solve problems would be the goal (Egelund, 2014). Therefore, one of the objectives of this paper is to explore what the existing literature says about the use of cloud services in this characterization of 21st century competency.

Lifelong Learning and Educational Development

Spring (2008) presents lifelong learning as a part of the discourse on the knowledge economy. Since technology changes rapidly and continuously, there is a continuous change in the knowledge economy. Therefore, it is important to prepare students for lifelong learning. This focus has a substantial impact on curricula (Spring, 2008). It is not just the technologies that are constantly changing, but also the global job market, and that is why Spring (2008) discusses the essential skills that students have to learn, namely: communication, interpersonal, and collaboration skills; the capacity to assume personal responsibility; and the ability to learn new subjects. At the same time, Castell presents the concept of "self-programmable labor" (Levinsen, 2011), which refers to the labor in the network society that allows self-initiated lifelong learning. This type of labor, unlike "generic labor," succeeds in the context of global competition. Castell suggests that the education system must accept the task of fostering self-programming students (Levinsen, 2011). Thus, in this study, one of the viewpoints is to inquire as to how CC contributes to lifelong learning and educational development.

QUALITATIVE SYNTHESIS

This section presents the qualitative synthesis of the 13 articles on using cloud computing in schools.

To begin with, the 13 texts were read and the relevant concepts were coded. The codes were generated from the text material. Accordingly, the analysis has an inductive starting point (Hewitt-Taylor, 2001). These codes represent different themes associated with the overall subject. A total of 31 themes were generated by the codes to reflect the context of the 13 texts. These 31 themes were then synthesized under five broad categories, which cover all the themes. Subsequently, all texts were read again, and the themes, in the form of selected quotes, were distributed across the five categories. Finally, the citations were processed according to whether they were central points, convergent statements, or divergent statements. The final qualitative synthesis was performed on these five categories. Hewitt-Taylor's (2001) approach was regularly inspected to obtain the criteria: *reliability*, *credibility*, and *transparency* (Lincoln & Guba, 1985; Hewitt-Taylor, 2001). The themes were distributed across the following categories:

Category 1: Globalization
- Easier access to education, data access everywhere/accessibility/infrastructure, 21st-century skills

Category 2: Eductional benefits
- Motivation, teacher-parent communication, collaboration, flexibility, productivity, creativity, self-organized learning, communication, sharing of knowledge, problem-solving, responsible students/peer review/no bad excuses

Category 3: Administrative benefits
- Economy (operations, computer lifetime, licenses), time saved, BYOD, software diversity, documentation

Category 4: Barriers
- Technical barriers, cultural barriers, data security, privacy, school laws and regulations, age restrictions/parent acceptance, opacity, reliability

Category 5: Implementation
- Management support, paradigm shift in education, incongruence between implementation strategies, cloud implementation

Table 1 presents an overview of the articles and a matrix for the identified themes in each of the papers.

Table 1. Schematic overview of the articles

Year of publication	2010	2011		2012				2013					2014
Author	Thomas	Weil	Carroll, Merwe & Kotze	Chandra and Borah	Stein, Ware, Laboy, & Schaffer	Bedell, C.	Masud, Xiaodi & Yong	Alizadeh & Hassan	Hung & Lin	Mahalingam & Rajan	Kovnot, Norton, Cloutier &	Ullman	Bathon
Title	paradigm for practicing the scholarship of teaching and	On Cloud Nine	Secure cloud computing: Benefits, risks and controls	Cost benefit analysis of cloud computing in education	via a Cloud designed for	The state of cloud computing in K-12	Cloud Computing for Higher Education: A roadman	Challenges and opportunities of Mobile Cloud Computing	Integrated Cloud Application in School Knowledge	Affordances of the 21st	Privacy and Cloud Computing in Public Schools	The Case for Cloud Computing in K12	The Fine Print on Cloud Computing
Background													
Geographical distribution	Botswana	USA	South Africa	India	USA	USA	Australia	Malaysia	Malaysia	Dubai	USA	USA	USA
Type of text: Conference article (C) or journal article (J)	J	J	J	C	J	J	C	C	C	C	J	J	J
Themes													
21st century skills	x			x					x	x			
Age Restrictions/parents' acceptance											x		
Responsible students/Peer review/No bad excuses	x	x											
Bring Your Own Device (BYOD)		x		x		x			x	x		x	
Cloud implementation		x		x			x		x		x	x	
Data security	x		x		x	x		x			x		x
Data access everywhere/accessibility/infrastructure	x	x			x	x	x	x	x	x	x	x	
Software diversity		x			x				x				
Documentation	x	x							x				
Reliability											x		
Flexibility	x	x		x		x	x	x	x	x		x	
Globalization	x	x		x		x			x	x		x	
Incongruence between implementation strategies							x		x				
Collaboration	x	x		x		x			x	x		x	
Communication (students/teachers/parents)		x									x	x	
Creativity				x						x			
Cultural barrier		x			x	x	x		x	x			
Management support									x	x			
Laws and regulations for schools	x										x		x
Motivation	x	x											
Easier access to education	x					x							
Paradigm shift in education	x	x				x						x	
Problem-solving										x			
Productivity	x	x		x		x				x		x	
Self-organized learning		x				x							

Teacher-parent communication													
Technical barrier					x			x			x		
Time saving	x											x	
Opacity											x		
Sharing of knowledge	x	x				x	x			x		x	
Economy (operation, computer lifetime, licenses)	x	x			x	x					x	x	

Figure 1: Geographical distribution of the 13 articles

Category 1: Globalization

Some of the most striking examples of CC's influence in the global arena is described in the articles at two levels. One example is the use of CC in an educational context to increase living standards in the world's most vulnerable regions. The other is the inherent potential of CC to support the skills needed in the global community.

Mahalingam and Rajan (2013) give insight into how CC has found its way into education, explaining that, "One such development which is gaining acceptance and widespread adaptation is 'cloud computing,' supported by the notion of 'bring your own device' (BYOD)" (p. 125). The prevalence of CC in areas of great economic diversity is due to their perspective, which is partially the result of BYOD, as this enables the areas to be included in the global education community. Chandra and Borah (2011) adds that there is less of a need to upgrade the software when using CC.

India is described as an example of how education is becoming an important factor for development and the rise in general living standards:

> The development of the education sector is [a] solution for economic growth and improvement in the standard of living. The challenges posed by the growing demand for education requirements are gigantic. India will have about 45 million people in the age group of 18 years to 20 years by 2020 (Chandra & Borah, 2011, p. 4).

Therefore, India wagered on the National Knowledge Network (NKN), whereby the country's knowledge-related institutions were given high-speed networks to make scientists and researchers capable of offering students instructions via CC in areas of growth or deprivation (Chandra & Borah, 2011). Bedell (2014) estimates that CC helps ensure that people in all regions can have access to quality education, something that cannot be done without the cloud. Therefore, in the coming years, CC is predicted to grow globally in its use for educational purposes.

Duffy and Jonassen (in Mahalingam & Rajan, 2013) look at the demands of globalization for the students' skills in the 21st century and how teachers, by utilizing CC, can support the development of these skills among students:

> Teachers in the role of facilitators can leverage the cloud infrastructure built by Google, Box, Podio, Microsoft and several others to practice and prepare the students for the 21st century skills. Students can now create a project report in Google Drive or Microsoft SkyDrive and start collaborating by editing, commenting and engagement in knowledge construction any time anywhere working simultaneously in the same document, which changes the way people look at collaboration in the 21st century (Mahalingam & Rajan, 2013, p. 70).

The inherent affordances of CC that enable a ubiquitous global learning environment can facilitate an educational paradigm shift from teacher-centered to student-centered learning. These changing circumstances require teachers to be better prepared for new technology. CC's potential in education is further elaborated in the following section.

Category 2: Educational Benefits

The literature points to a number of advantages for CC use in education, some of the most prominent being collaboration, efficiency, motivation, universal data access, and unlimited space for data storage.

The widespread use of BYOD in schools, as well as the increase in the use of tablets in the classroom, supports the need to consider CC (Mahalingam & Rajan, 2013). One of the major benefits of CC in education is the potential for collaboration. As Chandra and Borah put it, "In Cloud Computing[,] teachers and students [as well as] students and students can implement collaborative learning such as the online exchange, online document editing, …[and online use of the] concept map tool[s] like [the] Google Collaboration Platform" (2011, p. 2). The intent of collaboration is for all students to contribute, which helps to create a cooperative culture (Hung & Lin, 2013; Thomas, 2011).

Collaboration creates a community in which it is possible for students to receive emotional support while building trustful ties within the student group. This is not restricted to inter-student relations, however, as teacher interactions can also be improved through CC. As (2011) described, "If Mitchell happens to be online while students are working on their assignments, he can simply 'pop in.' Students can communicate with him or with other students via instant message. Mitchell can also give instant demonstration, and the students can follow up immediately with questions" (p. 3).

This kind of "real time" feedback is crucial to students' success. The fact that teachers can collaborate on the knowledge construction with their students enables them to give timely support and comment on their work (Mahalingam & Rajan, 2013). The community this creates will be capable of overcoming the indifference of self-studying and improving interactions between the users (Chandra & Borah, 2011; Hung & Lin, 2013).

Furthermore, cloud computing also creates more efficiency and motivation among students. "Using the application also holds students more accountable; excuses like 'the dog ate my homework' don't fly in the virtual world [...] Students come to class prepared […] That alone creates a more enriching and efficient classroom environment" (Weil, 2011, p. 3). With this technology, teachers can teach more convincingly, and thus create greater enthusiasm and motivation among students (Weil, 2011).

Another major advantage of CC is that it provides access to information anywhere. As Thomas puts it, "Users can reach into the cloud for resources as they need from anywhere at any time. For this reason, cloud computing has also been described as 'on-demand' computing" (2011, p. 218). This creates more flexibility in the school day and allows learning to continue outside of school (Stein, Ware, Laboy, & Schaffer, 2012). The primary advantage of this is that teachers and students have easy access to information and can share documents immediately. This means that we are moving more and more into a future of self-organized learning, according to Bedell (2014). Furthermore, the availability of information outside of school improves communication between school and home:

> Through access to certain information stored in the cloud, teachers can have better communication with parents and students when it comes to projects, tests and assignments. Teachers can post messages. Parents can log in to secure servers to check their child's progress and online cloud forums allow for two-way school-to-home dialogues (Ullman, 2015, p. 3).

By extension, the literature highlights unlimited storage in cloud services as an advantage. "Both Microsoft and Google recently announced unlimited storage, relieving districts of the massive storage requirements associated with digital student portfolios" (Bedell, 2014, p. 3). The advantage of this is that no one needs to make backups or transfer data from one device to another (Thomas, 2011). Groups can also quickly gather a variety of

information in one place and easily share it with another group for viewing or editing, the whole school, or the entire world (Hung & Lin, 2013). The same applies to the teachers:

> Teachers can review what they have accomplished in the past. At the beginning of the year, when teachers make their plans for the upcoming school year, it can serve as a good repository of their experiences and ideas, especially, when different personnel take over new posts. Moreover, they can quickly review past experiences and work tasks (Hung & Lin, 2013, p. 7).

Category 3: Administrative Benefits

At the administrative level, CC distinguishes itself by offering a number of benefits to the individual school, the whole school district, and collaboration across schools. The administrative benefits can be divided into: 1) the economic benefits of the use of CC; 2) division of labor, which can be improved by using CC; and, finally, 3) the streamlining of already established school procedures.

Economy

The literature paints a clear picture of a wide range of economic benefits for using CC in schools. For one thing, CC can serve as a more cost effective way to increase productivity and collaborative learning activities in schools (Bedell, 2014, p. 4).

By using CC, there is no longer a need to install software locally on the computer, which is preferable economically since software maintenance is outsourced to the cloud service. As Thomas (2011) describes, "There is no need to buy hardware and software licenses and pay for maintenance. Thus, the cloud model offers a much cheaper way to acquire and use IT services; this is quite beneficial especially for educational institution in these days of appalling economic crunch" (p. 218). In addition to the maintenance savings, CC allows document exchange between teachers and students to be done digitally, which eliminates the need for expensive printing and copying solutions. Ullman (2015) estimates that switching to a cloud service saves up to five times more than the current analog solutions.

The use of CC is also highly scalable, as it is both quick and easy to purchase additional licenses for a cloud service, as opposed to investing in new software installation. It is easy to start small and then buy more licenses when the need arises (Ullman, 2015, p. 6). Furthermore, "By its design, cloud computing is scalable, flexible and elastic—offering IT departement a way to easily increase capacity or add additional capabilities when necessary, without investing in new and expensive infrastructure, training new personnel, or licensing more software" (Thomas, 2011, p. 219; Stein, Ware, Laboy, & Schaffer, 2012). In many cases, different users can use the software licenses at different times. For example, a school of 500 students could buy just 100 software licenses to cloud services and then take turns using them. As Ullman (2015) explained, "With most cloud services, the district pays for only what it uses (in terms of storage and services)" (p. 5). In many cases, a higher price is negotiated for shared licenses to compensate for the increased use, but it is still a significant saving for financial pressed schools (Stein, Ware, Laboy, & Schaffer, 2012, p. 238).

Cloud services are used online, so there is no software installed locally on the school's computers. This releases storage space and allows older computers an increased their life span, as the cloud services are run remotely from a computer with better processing power. As one piece of literature describes, "The Cloud opens the door to low-cost computing power. Because the computational power needed to run applications is provided remotely, schools can save costs through the use of older and less powerful computers. Lengthening the life of hardware substantially lowers the cost of ownership" (Stein, Ware, Laboy, & Schaffer, 2012, p. 238). Chandra and Borah (2011) conclude that the cost of switching to a cloud service is cheaper than replacing older computers.

Division of Labor

By switching to CC, technical barriers such as software updates and system crashes are no longer an issue for the school or the teacher. The cloud service provider ensures that the software is updated and working properly and allows further access to the material anywhere and anytime (Weil, 2011, p. 4). This frees up the teachers' time as they no longer need to take care of technical challenges, but can instead focus on their core mission—teaching (Hung & Lin, 2013; Ullman, 2015).

Streamlining

Teachers can be more efficient by using CC, since "by storing content online, teachers no longer need to spend time and resources printing or copying long documents or lesson plans" (Ullman, 2015, p. 3). In addition, the barriers that some teachers face by working with technology dissapear, as working with CC does not require

special IT knowledge from the teacher, as "there is no requirement for professional programming abilities. We do not need to worry if the School does not have a professional programmer. We can concentrate on our work and responsibilities as long as we can do basic data entry" (Hung & Lin, 2013, p. 7).

Teachers' and students' materials are stored online, which eliminates both the need for USB drives to store data and the need for archives to hold large folders with printed assignments and student information. Thomas (2011, p. 219) describes efficiency as "no need to copy all stuff from one PC to another when buying a new one. It also means you can create a repository of information that stays with you and keeps growing as long as you want them."

Category 4: Barriers

After a review of the educational and administrative benefits of CC, it is important to clarify what barriers the literature highlights. The cultural barriers are most important, while the technical barriers have a less prominent role.

Besides these two barriers, there are also a number of concerns regarding the use of CC in schools. These uncertainties mainly regard confidential agreements, which, among other things, involve privacy, security, anonymity, monitoring, reliability, and responsibility (Thomas, 2011, p. 220).

Cultural Barriers

As the literature describes, "One of the central insights we have gained is that the barriers to adoption are as much, if not more, cultural than technical" (Stein, Ware, Laboy, & Schaffer, 2012, p. 239). Cultural barriers are one of the biggest obstacles to the integration of CC. One of the critical challenges is the mismatch between digital immigrants, who constitute the majority of teachers, and the digital natives, or the students. The challenge for teachers is to manage and follow technological development (Mahalingam & Rajan, 2013).

> Much of the resistance to change to adopt these technologies is intrinsic rather extrinsic. Teachers are often comfortable to main the status quo and resist changing due to the fact that these technological affordances are still concidered as optional and often viewed as tech savvy teacher's prerogative (Mahalingam & Rajan, 2013, p. 127).

Teachers must see the benefits of the technology and discover that they can meet their needs more efficiently by using it. In addition, there needs to be training and support in the use of CC from a colleague or an IT professional who can see the potential and is willing to carry the initiative forward (Stein, Ware, Laboy, & Schaffer, 2012). It requires planning and leadership to train these teachers so they can see the value in CC, understand how to use it, and integrate it into their current pedagogy (Bedell, 2014). The potential for sharing knowledge effectively among teachers via CC is obvious, but an organizational culture that supports this method of working must first be established, as this will create a change that supports and encourages teachers to use the technology so empty virtual archives can be avoided (Hung & Lin, 2013, p. 8).

Another barrier is the fact that technology changes rapidly, meaning that once the teachers have learned to use one function, it either evolves or a better competitor enters the market. According to Mahalingam and Rajan (2013), this creates confusion and frustration among teachers, which means that they end up waiting to see what the next change will be and the integration of technological development fails.

Technical Barriers

Previously described under *administrative benefits*, the technical barriers are no longer a challenge for schools, as the providers of cloud services are responsible for updating and maintaining the software. Additionally, it is required that the Internet functions, including its speed, so the practitioner can use CC, and each device must allow this use of it (Alizadeh & Hassan, 2013; Mahalingam & Rajan, 2013, p. 12).

Security

The literature highlights data security as a major concern, since schools have an obligation to treat sensitive student data confidentially (Stein, Ware, Laboy, & Schaffer, 2012, p. 238; Bedell, 2014, p. 4). Barthon (2013) points to this particular issue as a major limiting factor for schools to fully start using cloud services.

In a digital world, data is constantly created, archived, and deleted, and the default setting for the Internet is that it is open, meaning that all data that interacts with the Internet can be shared. This creates a problem for schools, which are under an obligation to keep student information secure (Bathon, 2013, p. 23). For this reason, confidentiality agreements between these cloud services and schools or school districts are crucial (Bathon,

2013, p. 24). As Bathon (2013) phrased it, "It is important that these documents specify that the private cloud company has no ownership interest in the intellectual property contained in the uploaded data" (p. 24).

However, cloud services can be difficult to fully understand, and the confidentiality agreements are no exception. One US study showed that only 25% of school districts inform parents that they use CC, and 20% of districts have no policies regarding online services. In addition, a large proportion of confidentiality contracts contain large gaps or are completely lacking in privacy policies (Reid Berg et al., 2013, p. 5).

This survey also indicated that school districts often surrender control of student information when using cloud services. Less than 25% of the agreements between school districts and cloud services specify the purpose of the publication of student information, and fewer than 7% of the districts prohibit the sale or use of student information for commercial purposes. Despite this, the Family Educational Rights and Privacy Act (FERPA) requires that the districts have direct control over the students' information when they are published to a third party (Reidenberg et al., 2013, p. 5).

Category 5: Implementation

Regarding the implementation of cloud services in educational institutions, the literature presents a number of recommendations, primarily aimed towards considerations related to the chosen implementation strategy. It also gives recommendations in order to clarify and anticipate the various barriers that can occur when CC is used in education.

In preparation for a strategic plan for CC implementation, it is recommended to identify the motives for the change: "Drivers for considering cloud computing solutions for educational institutes should be identified in the context of the institutional strategy and how well they align" (Masud, Yong, & Huang, 2012, p. 555). In order to succeed, it is important that the institutional strategy adapts to the CC needs:

> The success of the strategy implementation depends on the existence of a service-oriented architecture at the level of the institution that offers the necessary infrastructure for cloud implementation. Also, in order to have success, the cloud strategy must be aligned with the institutional strategy (Masud, Yong, & Huang, 2012, p. 553).

Furthermore, it is recommended that this be done early in the process in order to fully benefit from the experiences of pilot projects and to identify solutions to challenges before the full rollout is implemented. Hung and Lin (2013, p. 7) added another relevant consideration: "The most important consideration is the needs of its users." In this perspective, the user requirements should be the main motive in the implementation strategy.

Once a school district has decided to implement CC in education, it is important that it establishes policies and implementation plans for the use of the cloud service, according to Reidenberg et al. (2013). Teachers need training courses, and there must be readily available support to provide advice and assistance to teachers in the handling of data and security. Thomas (2011) points out that most teachers who make use of educational technology simply convert educational content into an electronic format and preserve the traditional knowledge-centered teaching didactics. This may delay the implementation process considerably, as: "the change is very slow or not forthcoming at all for various reasons" (Thomas, 2011, p. 216).

Moreover, the support of school leaders determines whether a new technology such as CC is integrated in the classrooms and used by the teachers (Hung & Lin, 2013). It is important that these leaders promote the importance of knowledge sharing and the creation of a genuine knowledge-sharing culture among teachers.

QUANTITATIVE SYNTHESIS

As a basis for the qualitative analysis, the remaining 13 items were used and described in the chart below (Figure 3). Five of these articles were presented at conferences between 2012 and 2013, and the remainder were published in journals between 2010 and 2015. Six of the thirteen articles describe the conditions of the use of CC in the American school system. Furthermore, articles are included from Botswana, Malaysia, India, Dubai, South Africa, and Australia.

The authors of these articles represent great geographical diversity. The majority of the researchers are based in the universities of the United States, including the Massachusetts Instititute of Technology, Fordham University, and the University of Kentucky. Beyond that, researchers are affiliated with universities in Australia, China, Japan, Malaysia, Botswana, South Africa, and the United Arab Emirates. Therefore, the articles present a wide geographical distribution of contexts for CC use, which enables a globalized look at the use of CC in schools.

Figure 2 is a representation of the keywords that are used most frequently in the 13 articles. This word cloud creates an immediate overview of the essential themes from the articles.

Figure 2: Word cloud of the keywords (generated using www.wordle.net)

CONCLUSION

The purpose of this paper was to investigate and provide an overview of the prospects and problems of cloud computing in schools. Using the systematic review methodology, 13 articles dealing with the integration and adoption of cloud computing in schools were selected and analyzed. These articles cover experiences across seven different countries and four different continents. After a thorough reading of the texts and the use of coding techniques, 31 themes and 5 categories were created as the basis for a qualitative analysis.

This paper has uncovered two distinct potentials regarding the use of CC, from a *globalization perspective*. First, CC allows teaching and learning to be accessed by a larger part of the population, including in countries and regions where distance learning has thus far been problematic. This increased level of education creates economic growth and can thereby increase the living standard in the world's most vulnerable areas. Second, the use of CC supports and scaffolds the current global discourse on educating future citizens with 21st century skills. However, there is still a gap in the literature showing the geographical distribution of CC use worldwide.

On a local level, there are a number of *advantages in education* related to the use of CC in schools. The prominent advantage is that CC enhances student collaboration, which promotes motivation and helps keep the students responsible for their own work within the community. The universal access to data across time, space, and devices allows the teaching, learning, and collaboration to take place anywhere and at any time. Finally, the review points to the advantage of unlimited data storage, which removes the problems of data loss or inaccessibility; these functions enable students and teachers to develop an ongoing portfolio of the students' work and progress in school.

A number of *administrative advantages* are also identified, especially regarding the use of CC in schools and across entire school districts. Among these are a number of economic benefits that the educational institution or the district can harvest by discontinuing local storage and authority and by adopting cloud service. These include maintenance outsourcing, extended hardware life, reduced licensing costs, and savings on expensive printing and copying solutions. In addition to the economic aspect, a number of efficiency improvements exist in the organization of work, which can reduce local resource requirements.

Despite the clear potential, the literature has highlighted a number of *barriers* in implementing CC in schools. Local cultural norms can inhibit to change, and the disparity between the teachers as digital immigrants and the students as digital natives presents an issue. Safety is also a challenge that cannot be neglected when using CC in schools. Schools are subject to national guidelines for data security, and students have the right to the privacy and the security of their data. There is a sharp contrast between the characteristic openness of the Internet and the impenetrable confidentiality agreements that the users and providers of the cloud services require. The literature is still incomplete regarding the security issues, and the results presented in this paper are exclusively based on experiences from the US.

Finally, some recommendations are presented for the future *implementation* of CC in schools. This includes a clear implementation strategy and consistent management support. Moreover, the review presents a great deal of advice for clarifying and anticipating the barriers that can occur when a CC system is implemented in a school. It is important to note that the recommendations for an actual deployment strategy are not reported by existing literature, and such a strategy will differ according to country, district, and school policies.

It is clear that CC should be implemented with careful consideration of the factors associated with each school's context. This is still a new technology concept, though the literature has yet to clarify any undesired outcomes caused by the adoption of CC.

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Trends in Distance Education: A Content Analysis of Master's Thesis

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ABSTRACT
The present study aimed at presenting the results of content analysis on Master's Theses carried out in the field of distance education at higher education level in Turkey between 1986 and 2015. A total of 285 Master's Theses were examined to determine the key words, academic disciplines, research areas, theoretical frameworks, research designs and models, statistical analyses, data collection tools, participants, instructional design models, variables/research focus and related institutions. Therefore, the study is considered to be important since it tried to reveal the research trends of distance education in Turkey and to determine the related research trends.

Keywords: Content analysis, Master's Thesis, research trends, Turkish Distance Education

INTRODUCTION

Since the 19th century, when the concept of distance education first appeared, there have been great changes in distance education activities parallel to the developments in technology. It is seen that this change has occurred especially in the tools used in distance education, the technological sub-structure, learners' demographical backgrounds and in their expectations.

It is a well-known fact that a number of dissertations and Master's Theses have been conducted in this field especially at universities. As a result of these studies, an academically valuable product occurs. A student authoring a Master's Thesis has a supervisor, and the process of authoring the thesis is conducted under the guidance of the supervisor. At the end of the authoring process, the thesis is evaluated by a committee considering its originality, importance, contribution to the literature and methodology for the purpose of deciding on whether to accept or reject the thesis. Dissertations are more serious and meticulous studies that follow the process of Master's Thesis. Consequently, these theses are important to understand the field of distance education, to determine the related problems and to follow the trends.

In order to obtain information about the current state of distance education, it could be stated that it is necessary to create a related agenda by examining the studies published in refereed journals in the field and to review the published Master's Theses and dissertations. Bozkurt and colleagues (2015a) conducted a study examining dissertations within the context of Turkish distance education. However, in literature, there is no research carried out to examine Master's Theses. Examining the Master's Theses on distance education to contribute to this field is important to provide new ideas for future studies, to understand the changes in the field and to analyze the

current related situation. In this respect, the purpose of this study was to examine the Master's Theses carried out on distance education between 1986 and 2015 with respect to certain variables and to reveal the current state of distance education. The study included the following headings: a) What are the most frequently used keywords, academic disciplines, research areas, theoretical/conceptual frameworks, research designs, research models, tests and analysis, data collection tools, participants, and variables/research interests; and b) what are the leading contributor institutions in Distance Education (DE) research in Turkey.

Review in Distance Education

Koble and Brunker (1997), in their study, examined 129 papers published in the journal of American Journal of Distance Education (AJDE) and found that quantitative studies were conducted at most and mixed studies at least. Mishra (1997) examined the studies published in the journals of AJDE, Distance Education (DE), Open Learning: The Journal of Open, Distance and e-Learning (OL), and Indian Journal of Open Learning (IJOL) between 1991-1996. The researcher reported that the most frequent method was descriptive method; the most favored data collection tool was questionnaire; England was the country where most studies were conducted; and the most common discussions were about students' viewpoints regarding distance education.

Berge and Mrozowski (2001) examined 890 papers published in AJDE, Journal of Distance Education (JDE), DE and OL between 1990-1999. The researchers used the categorization method put forward by Sherry (1996) and found that descriptive studies were most common. In addition, it was revealed that there was a significant increase in the number of descriptive studies by years and that there was no significant increase or decrease in the number of case studies, correlational studies and experimental studies by years. It was seen that most studies were carried out on the dimension of distance education design and that there was quite a little research on the area of cost and benefit. Lee, Driscoll and Nelson (2004), who examined the same journals between 1997-2002, reached 361 papers. The most frequent method used in these studies was the case study method. It was found that theoretical research topics were dominant.

In one study carried out by Zawacki-Richter (2009), the research fields related to Distance Education were classified. In the study, 26 participants from 11 countries (Australia, Brazil, Canada, China, Fiji, Germany, Ireland, New Zealand, South Africa, England and USA) were asked for their views. In line with their views, the distance education studies were grouped under three categories: Macro, Meso and Micro.

Zawacki-Richter, Bäcker and Vogt (2009) examined 695 papers published in five different journals related to distance education between 2000-2008. According to the classification put forward by Zawacki (2009), it was found that the most common research field was "interaction and communication in learning environments" and the least was "costs and advantages". In the study, it was reported that there was a positive increase in the numbers of quantitative and qualitative studies by years and that there was a decrease in the number of mixed studies.

Salar (2009) examined studies published in 15 refereed journals in Turkey between 2003-2008. In the study using the classification put forward by Berge and Mrozowski (2001), it was found that the most common research topics included selection and acceptance of technology, design issues, redefining key participant roles, strategies to increase interaction, and active learning. In addition, it was revealed that descriptive studies were more common when compared to other research types.

De Olivera Neto and Dos Santos (2010) compared 983 studies conducted in Brazil between 1987-2006 with 983 studies published in ADJE. In their study, the researchers used the categorization systems put forward by Gall, Borg, and Gall (2006) and by Lee, Driscoll and Nelson (2007). It was found that most studies in Brazil were conducted on administration while most studies in USA focused on evaluation.

Davies, Howell and Petrie (2010), in their study, examined 308 Master's Theses and dissertations conducted at universities in North America between 1998-2007. In the study using the content analysis method, it was revealed that there was a decrease in the number of studies regarding technology use. Most of the studies were carried out with the survey and case study methods, and the number of action research studies was lowest. The most frequent data collection tool used in these studies was found to be questionnaire.

Horzum, Özkaya, Demirci and Alparslan (2013) examined 35 papers published in Turkish journals in the field of educational sciences in Turkey between 2005-2011. It was found that there was an increase in the number of studies focusing on the use of web technologies and that the most common dependent variables were achievement, satisfaction and attitude. Among the data collection tools, the prominent ones included interview form, document analysis and scale.

Bozkurt and colleagues (2015b) examined 861 research articles published in the journals of AJDE, DE, The European Journal of Open, Distance and e-Learning (EURODL), JDE, The Journal of Online Learning and Technology (JOLT), OL and The International Review of Research in Open and Distributed Learning (IRRODL) between 2009-2013. The researchers reported that the qualitative research method was most frequent; the mixed method was least frequent; and questionnaire, interview and document analysis were among the most common data collection tools. Of all the qualitative studies, 76 of them used content analysis; 74 of them used thematic analysis; and five of them used discourse analysis. In qualitative studies, the case study method was the most popular. Mixed studies mostly included exploratory sequential and explanatory sequential studies. In terms of the participants, most studies were conducted with undergraduate students, postgraduate students, academicians and teachers, respectively.

Bozkurt and colleagues (2015a), in their study, examined 61 dissertations with respect to such variables as key words, academic discipline, research areas, theoretical/conceptual frameworks, research designs, research models, statistical analyses, data collection tools, participants, variables/research focus and institutions contributing to the field. The dissertations were those included in the Thesis Database of Turkish Council of Higher Education (TCHE) between 1986 and 2014. In the study, the classification method put forward by Zawacki-Richter (2009) regarding the research areas in distance education was used. According to this classification, the most favored research area was “Instructional Design” at Micro Level, which was followed by “Distance Teaching System and Institutions” at Macro Level. The least frequent research area was “Costs and Benefits” and “Management and Organizations” at Meso Level. When the studies were categorized according to academic disciplines, it was seen that “Education and Training” had the highest frequency, which was followed by “Communication Science”. In the dissertations examined, it was found that there was an increase in the number of theses based on theoretical grounds especially after 2011 and that the most common theory was “Technology Acceptance Model”. In relation to methodology, it was seen that quantitative studies were most common with a rate of 36%, which was followed by mixed studies with 33% and qualitative studies with 31%. In addition, the popularity of mixed studies was found to increase starting from early 2000s. It was also revealed that the dissertations were mostly based on such research methods as experimental design, case study and explanatory sequential mixed method. In quantitative studies, inferential analysis was conducted with a rate of 64%, while descriptive analysis was run with a rate of 36%. As for the qualitative studies, content analysis was applied with a rate of 63%, and thematic analysis was used with a rate of 37%. The most common data collection tools in these studies included questionnaire, interview and scale, respectively. Also, it was seen that the participants were mostly undergraduate students. As the leading contributor institutions, Anadolu University was the one that produced most dissertations in the field of distance education (40%).

METHOD

In the present study, content analysis was conducted on the Master’s Theses carried out in the field of distance education in Turkey between 1986 and 2015. The theses were reached via the database of TCHE. The TCHE database is an electronic database which includes the Master’s Theses and dissertations conducted and which researchers can access by taking the necessary permissions from the authorities in Turkey.

While reviewing the related literature, the following criteria were taken into account in relation to the theses:

1. They would be included in TCHE database,
2. They would be published between 1986 and 2015,
3. They would be Master’s Theses,
4. There would be permission for access to the theses.

The theses were searched on the basis of the selected key words using the conjunction “OR” in three phases:

1- 315 theses were reached using the keywords of "distance education", "distance teaching" and "distance learning",
2- 31 theses were reached using the keywords of "open education", "open learning" and "open teaching", and
3- 49 theses were reached using the keywords of "online education", "online learning" and "online teaching".

In accordance with the keywords used, a total of 395 theses were reached (31 December, 2015). Among these theses, those similar to each other were determined and excluded from the scope of the present study. As a result, 365 theses were obtained. Of these 365 theses, 80 of them were not included in the study for various reasons, either. Among these reasons for the exclusion of these 80 theses was the fact that there were studies focusing on the development of distance control systems but not on distance education; there were studies which mentioned distance education in the literature review part yet which were not generally related to distance education; and the research topics in some studies were not related to distance education though these studies were conducted

with distance education students. With the exclusion of such theses from the scope of the present study, there were 285 theses left in total to be examined in this study.
In order to find answers to the research questions, content analysis was conducted, and the related theses were examined with respect to certain variables. Descriptive statistics such as percentages and frequencies in relation to the variables were examined. These statistics were then interpreted in comparison with the results reported in other similar studies.

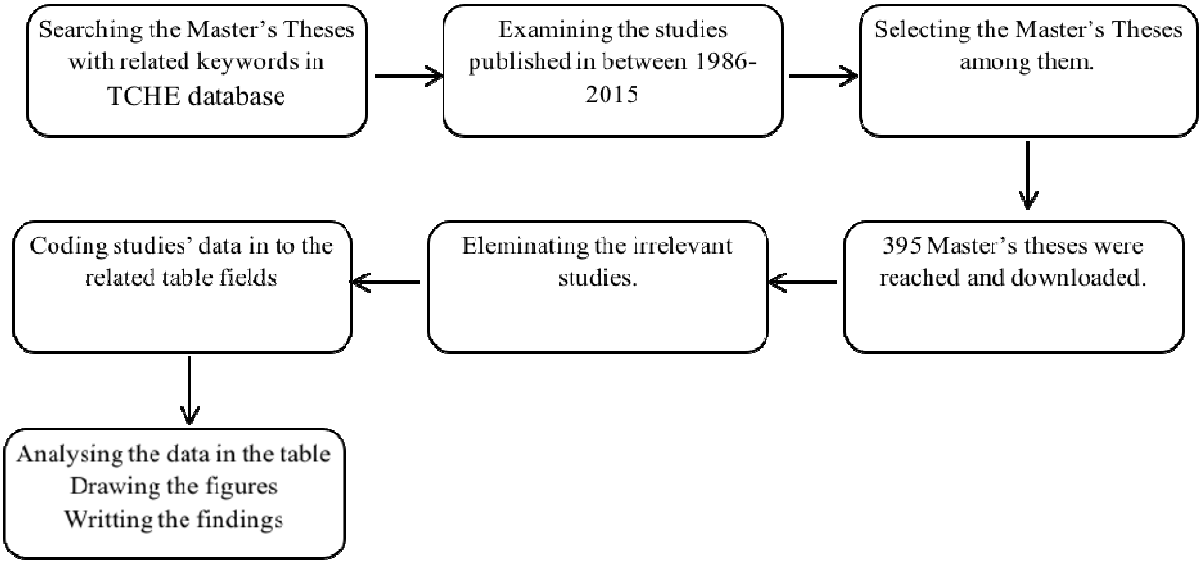


Figure 1. Diagram of thesis search process

Classification of Research Areas, Design and Model

Regarding the distance education research areas, a classification system was developed by Zawacki-Richter (2009) which was shown in Table 1. In the present study, this classification system was used, and the research categories of the theses were determined and reported meticulously. The reason for the use of such a classification system was that this system was frequently used in distance education review studies for the review of the related literature. Accordingly, the results of the present study can be easily compared with other review studies.

Table 1. Research Areas of DE (Zawacki-Richter, 2009)

Macro level: Distance education systems and theories.
1. ***Access, equity, and ethics***
The democratization of access to distance education afforded by new media and by finding ways to deliver high-quality education to those who have limited resources and poor infrastructure; issues that refer to the (sustainable) provision of distance education in developing areas. What is the impact of distance education (e.g., via mobile learning) on narrowing the digital divide and what is the role of ICT (information and communication technologies) and/or OER (open educational resources) in terms of access to education?
2. ***Globalization of education and cross-cultural aspects***
Aspects that refer to the global external environment and drivers, the development of the global distance education market, teaching and learning in mediated global environments, and the implications for professional development.
3. ***Distance teaching systems and institutions***
Distance education delivery systems, the role of institutional partnerships in developing transnational programmes, and the impact of ICT on the convergence of conventional education and distance education institutions (hybrid or mixed-mode).
4. ***Theories and models***
Theoretical frameworks for and foundations of distance education, e.g., the theoretical basis of instructional models, knowledge construction, interaction between learners, or the impact of social constructivism learning theories on distance education practice.
5. ***Research methods in distance education and knowledge transfer***
Methodological considerations, the impact of distance education research and writing on practice, and the role of professional associations in improving practice. Literature reviews and works on the history of distance education are also subsumed within this area.

Messo level: Management, organization, and technology.

1. ***Management and organization***

Strategies, administration, and organizational infrastructures and frameworks for the development, implementation, and sustainable delivery of distance education programmes. What is required for successful leadership in distance education? Distance education and policies relating to continuing education, lifelong learning, and the impact of online learning on institutional policies, as well as legal issues (copyright and intellectual property).

2. ***Costs and benefits***

Aspects that refer to financial management, costing, pricing, and business models in distance education. Efficiency: What is the return on investment or impact of distance education programmes? What is the impact of ICT on the costing models and the scalability of distance education delivery? How can cost effective but meaningful learner support be provided?

3. ***Educational technology***

New trends in educational technology for distance education (e.g., Web 2.0 applications or mobile learning) and the benefits and challenges of using OERs, media selection (e.g., synchronous vs. asynchronous media), technical infrastructure and equipment for online learning environments, and their opportunities for teaching and learning.

4. ***Innovation and change***

Issues that refer to educational innovation with new media and measures to support and facilitate change in institutions (e.g., incentive systems for faculty, aspects referring to staff workloads, promotion, and tenure).

5. ***Professional development and faculty support***

Professional development and faculty support services as a prerequisite for innovation and change. What are the competencies of online teachers and how can they be developed?

6. ***Learner support services***

The infrastructure for and organization of learner support systems (from information and counselling for prospective students about library services and technical support to career services and alumni networks).

7. ***Quality assurance***

Issues that refer to accreditation and quality standards in distance education. The impact of quality assurance and high quality learner support on enrolments and drop-out/retention, as well as reputation and acceptance of distance education as a valid form of educational provision.

Micro level: Teaching and learning in distance education.

1. ***Instructional design***

Issues that refer to the stages of the instructional design process for curriculum and course development. Special emphasis is placed on pedagogical approaches for tutoring online (scaffolding), the design of (culturally appropriate) study material, opportunities provided by new developments in educational technology for teaching and learning (e.g. Web 2.0 applications and mobile devices), as well as assessment practices in distance education.

2. ***Interaction and communication in learning communities***

Closely related to instructional design considerations is course design that fosters (online) articulation, interaction, reflection, and collaboration throughout the learning and teaching process. Special areas include the development of online communities, gender differences, and cross-cultural aspects in online communication.

3. ***Learner characteristics***

The aims and goals of adult learners, the socio-economic background of distance education students, their different learning styles, critical thinking dispositions, and special needs. How do students learn online (learner behavior patterns, learning styles) and what competencies are needed for distance learning (e.g., digital literacy)?

Reliability

According to the criteria determined via the theses obtained as a result of the review, a table was prepared, and each researcher analyzed the results separately and transferred them to their own tables. Following this, these tables prepared by the researchers were compared; the differences were determined; and the related theses were examined again. Inter-rater reliability of the coding was $\kappa = .820$. Altman (1990) proposes that the extent of agreement for Cohen's kappa can be qualified as poor (< 0.20), fair (0.21 to 0.40), moderate (0.41 to 0.60), good (0.61 to 0.80), and very good (0.81 to 1.00). Thus, the reliability of raters can be considered as very good. Content analysis ended arriving at a consensus on all the findings.

FINDINGS AND DISCUSSION

In this part of the study, the results were presented and interpreted in comparison with those of other studies reported in related literature.

Keywords

The keywords used in the Master's Theses were analyzed. The results were given in Table 2. When the keywords considered to be irrelevant to distance education were excluded, 11 different keywords were used 248 times. The most frequent keyword was found to be "Distance Education" with a rate of 47.1% (N=117), which was followed by the keywords of "Distance Learning" (n=51) and "E-Learning" (n=37). It was seen that the least frequent keywords used in the theses were "Distance instruction" (n=1) and "Virtual education" (n=1). These findings are similar to those reported by Horzum and colleagues (2013) and by Bozkurt and colleagues (2015).

Table 2. Keywords

Keywords	Frequency	Percentage
Distance Education	117	47.1
Distance Learning	51	20.5
E-Learning	37	14.9
Web-Based Education	10	4
Blended Learning	9	3.6
Online Learning	8	3.2
Mobile Learning	7	2.8
Web Based Learning	5	2
Open Education	2	0.8
Distance Instruction	1	0.4
Virtual Education	1	0.4
Total	248	100

Academic Discipline

In the study, it was seen that the Master's Theses belonged to 22 different disciplines which was shown in Table 3. The theses were mostly conducted in the field of Education and Training. These findings are consistent with those reported by Bozkurt and colleagues (2015a, 2015b) and by Zawacki-Richter (2014). The other disciplines that the other theses belonged to included Computer Engineering and Computer Science and Control (17.4%), Science and Technology (7.9%), Technical Education (6.3%), Electrical and Electronics Engineering (4.2%) and Business Administration (3.1%).

Table 3. Academic disciplines

Discipline*	Frequency	Percentage
Education and Training	206	54,4
Computer Engineering and Computer Science and Control	66	17,4
Science and Technology	30	7,9
Technical Education	24	6,3
Electrical and Electronics Engineering	16	4,2
Business Administration	12	3,2
Information and Records Management	3	0,8
Mechanical Engineering	3	0,8
Radio and Television	3	0,8
Statistics	2	0,5
Banking	2	0,5
Labour Economics and Industrial Relations	2	0,5

Other**	10	2,7
TOTAL	**379**	**100**

* The names of the academic disciplines originally belong to TCHE.
** The category of 'Other' includes the disciplines of Interior Design and Decoration, Anatomy, Biostatistics, Traffic, Bioengineering, Physics and Physics Engineering, Home Economics, Health Education, and Fine Arts.
*** In a single study, more than one academic discipline might have been used.

Research Areas

In this part of the study, the theses were examined and coded at three levels using the classification put forward by Zawacki-Richter (2009) (Figure 2).

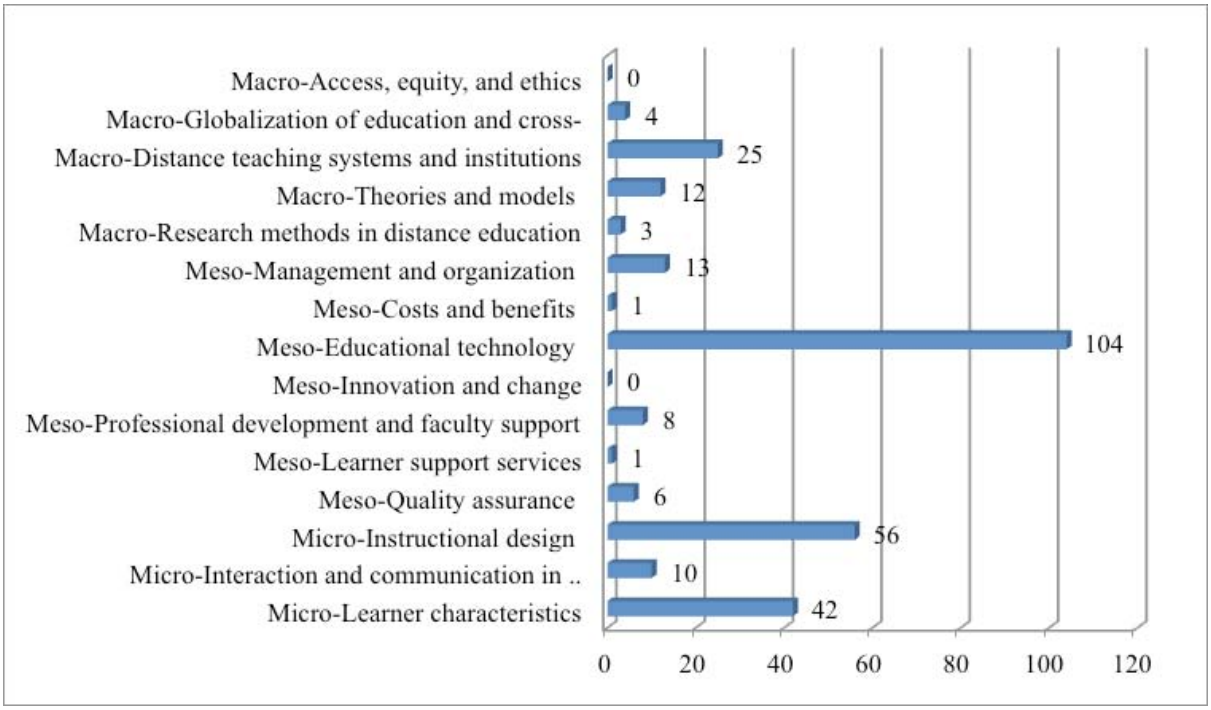


Figure 1. Research areas

As can be seen in Figure 2, among the prominent areas at meso level was "Educational Technology", which was followed by the headings of "Instructional Design" and "Learner Characteristics" at micro level. In addition, the heading of "Distance Teaching Systems and Institutions" was among the prominent ones at macro level. These four research areas were more common than the others. Bozkurt and colleagues (2015a), in their study, found that these four areas were the most popular ones. However, different from this study, Bozkurt and colleagues (2015a) reported that the most common area was Micro-Instructional Design. Depending on this result, it could be stated that the focus in doctorate theses was more on instructional design and that Master's Theses mostly focused on educational technologies. Similar to the studies conducted by Zawacki-Richter, Bäcker and Vogt (2009) and Bozkurt and colleagues (2015a, 2015b), there was no balanced distribution of the research areas revealed in this study.

Theoretical/Conceptual Framework

Among the theses examined, only nine of them were based on at least one theoretical framework. These theoretical frameworks were cognitive learning theory, Kolb's experiential learning theory, Lev Vygotsky's Social Development Theory, Transactional Distance, Media Richness Theory, System Approach and Constructivism. On the other hand, 276 theses included in the scope of the present study did not include any theory. According to Bozkurt and colleagues (2015a), approximately 30% of the dissertations were based on at least one theoretical ground, yet it was only 3% for Master's Theses. Depending on this result, it could be stated that Master's Theses did not include any theoretical framework at all.

Research Design

The research designs used in Master's Theses were examined in three categories: quantitative, qualitative and mixed. Figure 3 presents the distribution of these categories.

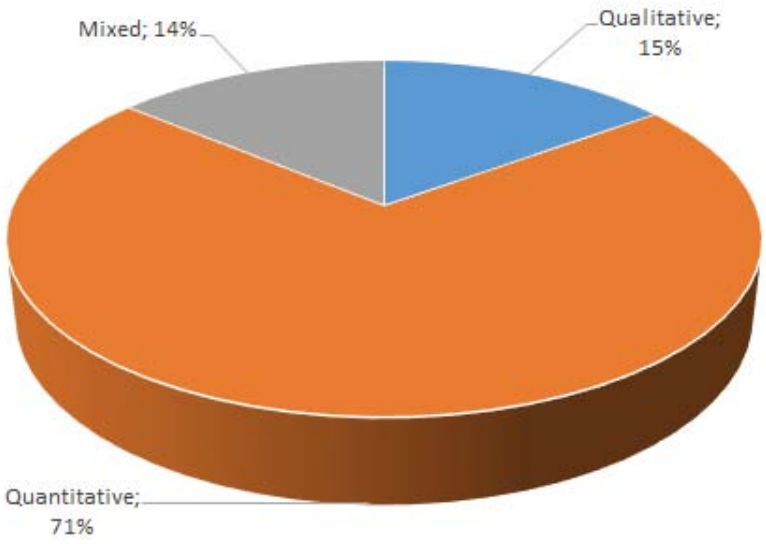


Figure 2. Research designs in Master's Thesis

As a result of the analysis of the data in the present study, it was found that of all the Master's Theses conducted in the field of distance education in Turkey between 1986 and 2015, 71% of them were carried out with the quantitative research design (N=148), 15% of them with the qualitative research design (N=31), and 14% of them were carried out with the mixed research design (N=28). These findings are supported by those reported in studies conducted by Koble and Brunker (1997), by Zawacki Richter and Prümmer, (2010) and by Bozkurt and colleagues (2015a). On the other hand, in contrast with these results, it was found that the studies carried out by Lee, Driscoll and Nelson (2004), by Hauser (2013) and by Bozkurt and colleagues (2015b) mostly included qualitative research design.

In the study, studies which included only one software, application or a system design and which did not involve any data collection except for the quantitative, qualitative and mixed research designs in the Master's Theses were gathered under the heading of Design Development. Table 4 presents the distribution of research areas by years. Different from these categories, three studies involved the use of Delphi technique.

Table 4. Research designs

Research Designs	1989	1993	1997	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	**TOTAL**
Qualitative	1	-	-	-		1	-	1	3	2	1	2	3	5	5	1	4	2	**31**
Quantitative	-	1	1	1	3	3	6	4	12	15	15	8	26	16	20	6	10	1	**148**
Mixed	-	-	-	-	-	-	1	1	2	1	2	4	6	2	5	1	2	1	**28**
Develop a Design	-	-	-	2	3	1	3	6	11	8	7	13	12	4	2	4	1	1	**78**
TOTAL	**1**	**1**	**1**	**3**	**6**	**5**	**10**	**12**	**28**	**26**	**25**	**27**	**47**	**27**	**32**	**12**	**17**	**5**	**285**

According to Table 4, it could be stated that there was an increase in the number of theses especially starting from the year 2006. At the same time, there has been a decrease in the number of theses in the last three years. However, this result, as required by the publication rules for the TCHE database, could be explained with the fact that some of the authors did not want their theses to be accessed after three years. A total of 46 theses conducted in the last three years were not included in the scope of the present study since it was not officially allowed to access them. Among all the theses examined in the present study, 27'% of them (N=78) were related to design development. Most of these studies were not conducted in the field of "Education and Instruction", and they generally belonged to the dimension of engineering. Figure 4 presents the graphical representation of Table 4.

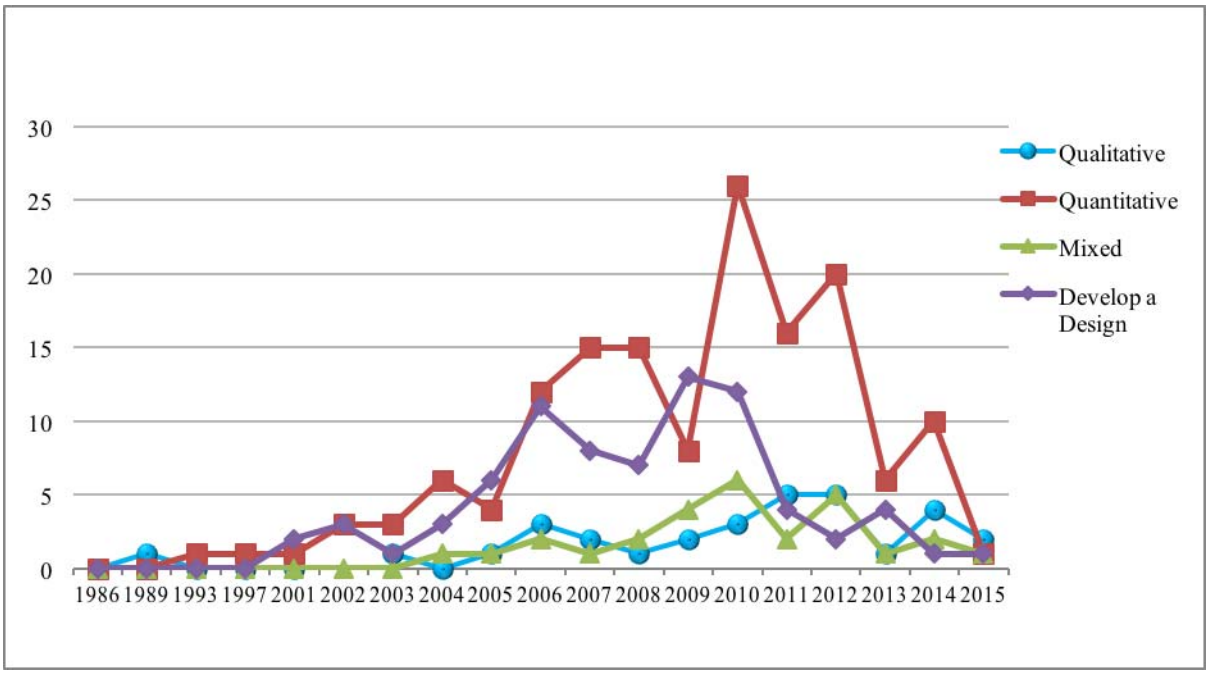
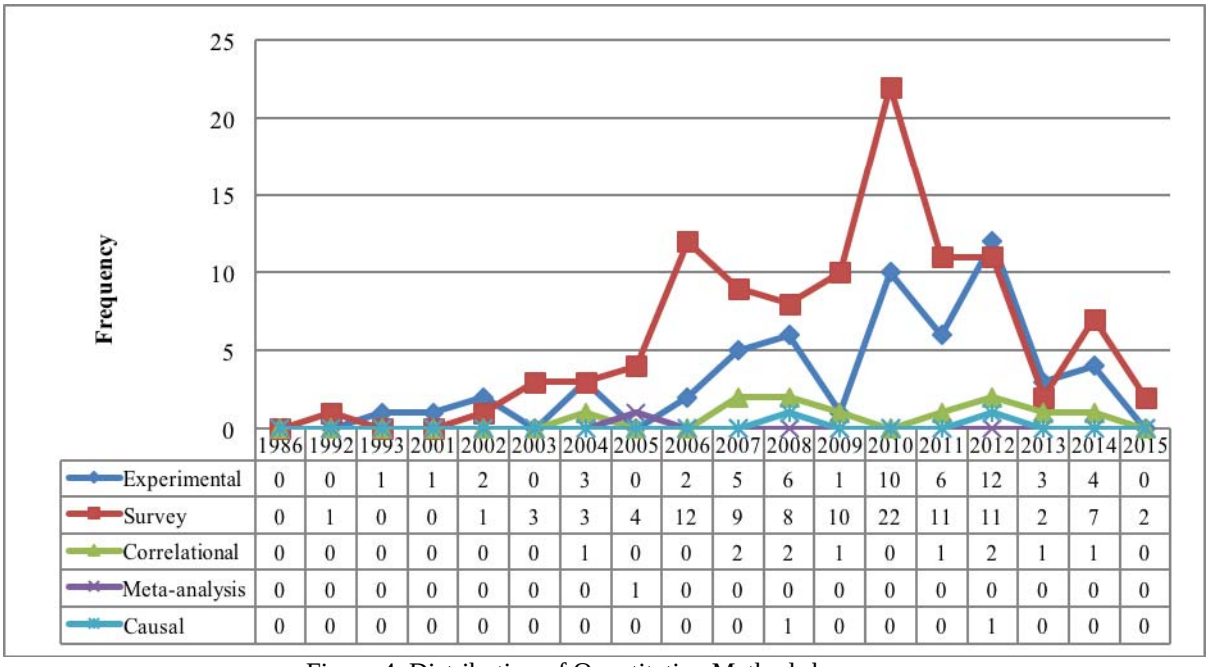


Figure 3. Distribution of research designs by years

According to Figure 4, when the distributions of the research designs were examined by years, it was seen that there was no thesis conducted between 1986 and 1988. The first thesis conducted in this field was in 1989 with a qualitative design. It was revealed that there was no thesis with qualitative design from 1989 to 2003 and that starting from 2005, qualitative studies became popular. When the research designs used in the theses were examined by years, no striking change was observed.

Research Model

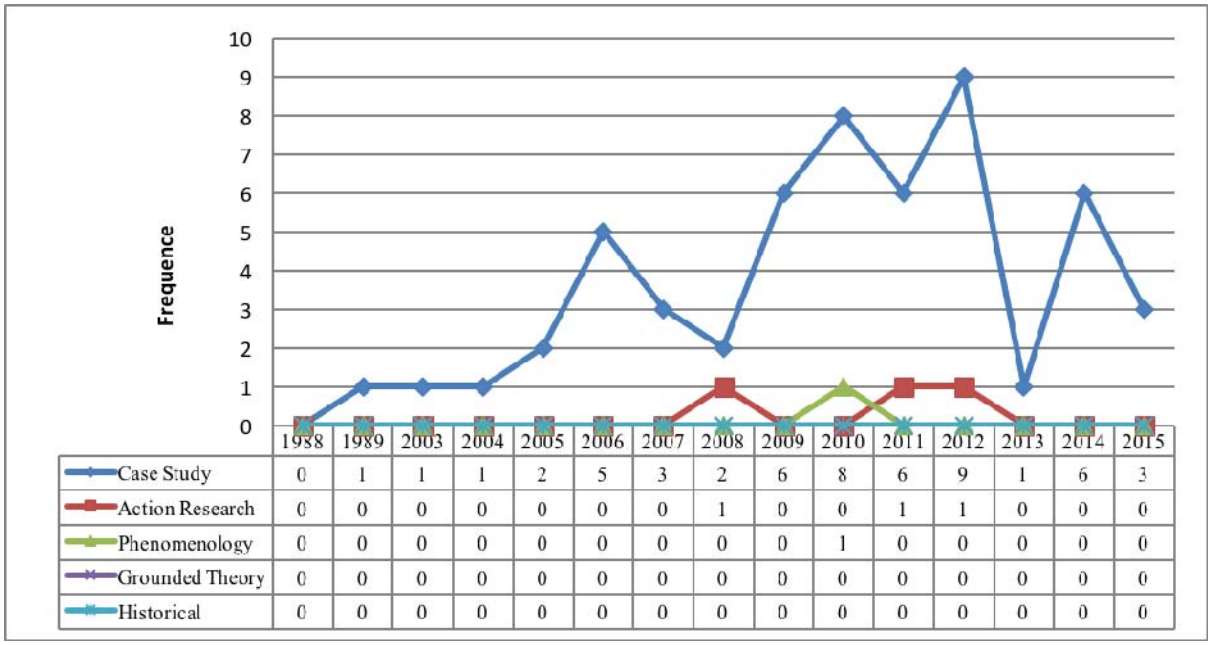
Under this heading, the three research models were examined, and the related findings were compared with those reported in related literature.



	1986	1992	1993	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Experimental	0	0	1	1	2	0	3	0	2	5	6	1	10	6	12	3	4	0
Survey	0	1	0	0	1	3	3	4	12	9	8	10	22	11	11	2	7	2
Correlational	0	0	0	0	0	0	1	0	0	2	2	1	0	1	2	1	1	0
Meta-analysis	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Causal	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0

Figure 4. Distribution of Quantitative Methods by years

Among the theses examined within the scope of the present study, it was found that the first thesis using the quantitative method was conducted in 1992. It was also seen that in the quantitative studies, the most frequent method was the survey method (N=106) and that the least frequent one was the meta-analysis method (N=1). These findings are consistent with those reported in other similar studies in related literature (Randall et al., 2010; Bozkurt et al, 2015). The number of studies using quantitative was highest (N=32) in 2010. When the table is examined, it is seen that there was a considerable increase in the number of studies using the survey and experimental models in 2010 in contrast with the remarkable decrease starting from 2013. The cause of this decrease could be said to be the fact that the authors started to prevent access to their theses in that year.



	1988	1989	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Case Study	0	1	1	1	2	5	3	2	6	8	6	9	1	6	3
Action Research	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0
Phenomenology	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Grounded Theory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Historical	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 5. Distribution of Qualitative Methods by years

Among the theses examined within the scope of this study, the first thesis using qualitative methods was conducted in 1989. It was found that in the theses using the qualitative methods, the most frequent method was case study (N=54). These findings are parallel to those reported in other similar review studies in related literature (Lee, Driscoll, & Nelson, 2004; Davies, Howell & Petrie, 2010). When the table is examined, it is seen that there was no thesis conducted with the grounded theory method and historical method, which are among qualitative methods. These findings support those of another study carried out by Bozkurt and colleagues (2015a).

When the related literature was examined, it was seen that there are several classifications in relation to mixed methods. In a common typology for mixed methods, mixed method studies include a three-dimension typology: (1) Level of mixing (partially mixed versus fully mixed, (2) Time orientation (concurrent versus sequential) and (3) emphasis of approaches (equal status versus dominant status) (Johnson & Onwuegbuzie, 2004). In this study, this classification was used for the theses conducted with mixed method.

Table 5. Distribution of Classifications of Mixed Method

Mixed Method	**f**	**%**
Level of Mixing		
Partially	15	56
Fully	12	44
Time Orientation		
Concurrent	6	22
Sequential	21	78
Emphasis of Approaches		
Equal Status	7	26
Dominant Status	20	74

According to Table 5, in the classification used, there was a balanced distribution regarding the level of mixing for the studies conducted with mixed method. When the theses were examined with respect to time orientation, it was seen that a great majority of the mixed studies were "sequential". Among these studies, there were five studies in which qualitative methods were used first, but in most of them, quantitative methods were used first. When the theses were examined with respect to emphasis of approaches, it was seen that most of the mixed theses included dominant status. Quantitative methods were more frequent in mixed studies with dominant status. In the review studies on distance education in related literature, there was no study using the mixed method with this classification.

Tests and Analysis

Table 6 presents the number and percentage analyses of the analysis techniques used in the theses examined within the scope of the present study. According to Table 6, 48% of the quantitative statistical tests included the method of descriptive statistics, and 52% of them included the method of inferential statistics. This finding is similar to the finding of another study conducted by Bozkurt and colleagues (2015b), while the researchers, in their study examining dissertations, reported a different result pointing out that inferential statistics were more frequent (Bozkurt et al., 2015a). In qualitative analyses, 68% included the content analysis technique, and 32% included the thematic analysis technique.

Table 6. Test and analysis

QUANTITATIVE Statistical Tests					
Descriptive (%48)		Inferential (%52)			
		Parametric (%83)		Non-Parametric (%17)	
Central Tendency (Mean/Median/Mode)	71	t-test	75	Chi-square	23
Relative Standing (Percentage/z-score)	135	Variance Analysis (ANOVA/MANOVA /MANCOVA)	67	Mann Whitney U	15
Variability (Variance/Standard Deviation/Range)	72	Reliability Analysis (Cronbach's Alfa)	61	Wilcoxon Test	5
Descriptive Statistics (Non Specified)	5	Correlation (Pearson)	26	Kruskal Wallis	9
		Factor Analysis (Confirmatory/Exploratory)	19		
		Regression Analysis	7		
		Structural Equation Modeling (SEM)	1		
QUALITATIVE					
Content Analysis					27 (%68)
Thematic Analysis					13 (%32)

*One study may employ more than one statistical test

When Table 6 is examined, it is seen that most of the descriptive statistics included the percentage and z-score values followed by central tendency statistics such as mean/median and mode and by variability statistics such as variance/standard deviation and range. In addition, a great majority of the inferential statistics included parametric tests. Among the parametric tests, t-test, variance analyses and reliability analyses were most frequent. The fact that the most frequent test among parametric tests applied in review studies conducted on distance education and on other similar research topics (Davies, Howell & Petrie, 2010; Bozkurt et al., 2015a) was t-test supports the related finding obtained in the present study. On the other hand, different from this study, mean score was the most frequent method of descriptive statistics used in those review studies.

When non-parametric tests were examined, it was seen that Chi-square and Mann Whitney U tests were most common. This finding is also consistent with those reported by Davies, Howell & Petrie, (2010) and by Bozkurt and colleagues (2015a) in their studies.

Data Collection Tools

Table 7 presents the number and percentage analyses regarding the data collection tools used in the theses examined within the scope of the present study. According to Table 7, the most popular data collection tools were questionnaire (41%), interview (16%), scale (14,5%) and pretest-posttest (14,5%), respectively.

Table 7. Data Collection Tools

Data Collection Tools	Frequency	Percentage
Questionnaire	127	%41
Interview	49	%16
Scale	45	%14.5
Pre-test / Post-test	45	%14.5
Observation	17	%5.4
Documents	12	%4
Electronic documents	12	%4
Focus group	3	%1
TOTAL	310	100

*One study may employ more than one data collection tools

The results revealed that use of questionnaire as a data collection tool was favored more when compared to the other data collection tools. It was seen that questionnaire was followed by interview and scale, respectively. This finding is parallel to those obtained in other related studies (Davies, Howell & Petrie, 2010; Bozkurt et al., 2015a; Bozkurt et al., 2015b). When compared with a content analysis study examining dissertations with respect to data collection tools (Bozkurt et al., 2015a), use of questionnaire at the level of Master's Degree was more frequent than it was in dissertations.

Participants

Table 8 presents the number of and percentage analyses for the groups of participants in the theses examined within the scope of this study.

Table 8. Participants

Participants	Frequency	Percentage
Undergraduate Students	77	32,6
Associate's Degree students	27	11,4
Academicians	26	11
K12-Students	23	9,7
K12-Teachers	21	8,9
Master students	10	4,2
Specialists	10	4,2
Adult Learners	8	3,4
K12-Administrators	3	1,3
Institutions	3	1,3
System/Program	3	1,3
Administrators	2	0,8
Other	27	11,4
TOTAL	237	100

*One study may employ more than one target group

According to Table 8, undergraduate students (N=77), Associate's Degree students (N=27) and academicians (N=26) were in the first three places constituting approximately 55% of all the participants. The group of participants named "Other" included engineers, religious officials, technicians, bankers, civil servants, documents and the participants about whom no information was available. The fact that undergraduate students and academicians ranked the first two in the list supports the findings reported by other studies in related literature (Bozkurt et al., 2015a; Bozkurt et al., 2015b). However, Associate's Degree students were not involved in one study examining the dissertations with content analysis (Bozkurt et al., 2015a), while they were in the second place (11,4%) in the present study, in which Master's Theses were examined.

Variables/Research Interests

Table 9 presents the theses categorized based on the dependent variables and sequenced according to their frequencies.

Table 9. Variables / research interests

Dependent Variables	Frequency	Percentage
Academic performance/success	41	26,7
Attitude	21	13,7
Effectiveness	19	12,4
Satisfaction	15	9,8
Perception	10	6,5
Motivation	5	3,2
Expectation	4	2,6
Other	38	24,7
Total	153	100

*One study may employ more than one dependent variable

According to Table 9, in 41 studies, "academic success" (26,7%) was the most frequently used dependent variable. The variable of "academic success" was followed by "attitude" in 21 studies (13,7%), "effectiveness" (12,4%), "satisfaction" (9,8%) and "perception" (6,5%). According to Table 9, the category of "Other" (24,1%) included such variables as students' views, readiness, awareness, self-efficacy, social skills and so on. It was seen in the present study that among the dependent variables determined in the theses examined, the variables of success and attitude were quite commonly used. These findings are consistent with those obtained in other studies carried out by Horzum and colleagues (2013) and by Bozkurt and colleagues (2015a, 2015b).

Leading Contributor Institutions

Table 10 presents the distribution of the institutions by years where the Master's Theses were conducted.

Table 10. Leading Contributor Institutions

Leading Contributor Institutions	1993	1997	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	%
Gazi University	-	-	1	-	-	1	2	7	6	1	3	10	4	3	1	6	-	45	**15.5**
Anadolu University	1	-	-	2	2	1	-	4	7	3	3	4	2	4	2	1	1	38	**13.3**
Sakarya University	-	-	-	1	1	3	-	4	2	2	1	3	-	1	1	1	-	20	**7**
Fırat University	-	-	-	1	-	-	2	-	-	1	-	1	2	5	1	1	-	14	**5**
Afyon Kocatepe University	-	-	-	-	-	-	1	1	-	1	6	2	1	-	-	-	-	12	**4.2**
Marmara University	-	-	-	-	-	1	1	2	1	2	-	3	-	2	-	-	-	12	**4.2**
Hacettepe University	-	-	-	-	-	-	-	2	1	2	1	1	3	2	-	-	-	12	**4.2**
Ankara University	-	1	-	1	-	-	-	1	1	-	-	3	2	-	1	-	-	10	**3.5**
Karadeniz Technical University	-	-	-	-	-	-	1	-	-		-	1	2	3	-	2	-	9	**3.1**
Süleyman Demirel University	-	-	-	-	-	-	2	-	-	1	2	1	-	1	1	1	-	9	**3.1**
Others	-	-	2	1	2	4	3	7	8	12	11	18	11	11	5	5	4	104	**36.4**
TOTAL	**1**		**3**	**6**	**5**	**10**	**12**	**28**	**26**	**25**	**27**	**47**	**27**	**32**	**12**	**17**	**5**	**285**	**100**

According to Table 10, Gazi University and Anadolu University were in the first two places in terms of the total number of theses conducted in the field of distance education at universities. These two universities were

followed by Sakarya University and Fırat University. Similarly, in a study carried out by Bozkurt and colleagues (2015a), who examined dissertations, Anadolu University and Gazi University ranked the first two. However, in their study, it was seen that 40% of all the dissertations were conducted at Anadolu University. Anadolu University was obviously prominent in the field of distance education at Doctorate and Master's Degree levels. Although Anadolu University is the second biggest mega university in the world (Wikipedia, 2015) and although it has been serving in the field of distance education since 1982, it could be stated that the number of Master's Theses conducted at this university is not at the expected level. According to Table 10, it is seen that there is no private university in the top-10 list. This situation could be explained with the fact that the number of education faculties at private universities is lower than those at state universities and that private universities are new in the country.

LIMITATIONS AND STRENGTHS

Within the scope of the present study, the Thesis Database of Turkish Council of Higher Education (TCHE) was scanned, and a total of 365 related Master's Theses with access permission were reached. In addition, 121 theses which were not permitted for access and 80 theses which were not relevant to the research topic of the present study were not included in the scope of this study. In order to access the theses which were not permitted to access, the authors of these theses were contacted. However, almost no positive response was received from the authors. The fact that the theses which were not permitted by the authors for access were not included in the scope of the present study could be regarded as a limitation of the study.

The present study examined the Master's Theses conducted between 1986 and 2015 and tried to reveal the current state of distance education studies in Turkey. Also, this study is considered to be important since it is the first study to conduct content analysis on Master's Theses in the field of distance education. Therefore, the findings obtained in the study are thought to shed light on future studies.

CONCLUSION

The present study examined the research trends in Master's Theses conducted in the field of distance education in Turkey between 1986 and 2015 with respect to certain variables. The results obtained in the study revealed that the most frequent academic discipline was Education and Training, which was followed by Computer Engineering and Computer Science and Control, Science and Technology, Technical Education, Electrical and Electronics Engineering and Business Administration, respectively. In terms of research area, it was seen that certain areas were dominantly favored. Especially "Educational Technology" at meso level, "Instructional Design" and "Learner Characteristics" at micro level, and "Distance Teaching Systems and Institutions" at macro level were among the most common research areas. When the keywords used in the theses included in the scope of the study were examined, it was seen that the most frequent keyword was "Distance Education". However, in 49 theses, no keyword was used. Of all the Master's Theses, only nine of them were based on a theoretical ground. When the frequency of use of research designs was examined, it was seen that the most common research design was quantitative design and that the least common one was mixed design. When the trend in the last decade was examined, quantitative studies were favored more despite the increase in the number of qualitative studies. The number of Master's Theses conducted in the field of distance education was highest in 2010. In addition, a remarkable decrease was observed in the number of studies carried out in the last three years. The reason for this decrease could be explained with the fact that the authors of the theses did not allow access to their studies. Therefore, 46 theses conducted in the past three years were not included in the scope of the present study since they were not allowed by their authors to access.

Of all the theses examined in the study, 78 of them (27%) were design development studies. These studies were mostly conducted out of the field of Education, and most of them covered the field of engineering. Learning environments revealed in design development studies could be said to contribute to the development of distance education.

In studies conducted with quantitative methods, survey model was the most frequent, and the least one was meta-analysis model. In addition, there was a serious increase in the number of studies carried out with survey and experimental methods in 2010. In studies carried out with qualitative methods, case study was the most frequent. There was no thesis conducted with the grounded theory method and historical method. For the theses designed with mixed methods, a classification method based on a three-dimension typology was used. According to this classification, especially the studies with mixed method were favored as "sequential", and studies with quantitative methods were dominant. In the theses, generally, questionnaire was used as the data collection tool, which was followed by interview and scale. The participant group most favored included undergraduate students, who were followed by Associate's Degree students and by academicians. When the tests and analyses were examined, it was seen that the distribution of the descriptive and inferential statistics was balanced.

Percentage/z-score was the most common statistical method in descriptive statistics, and t test was the most common in inferential statistics. The number of studies conducted was highest at Gazi University. In 2010, a considerable increase was observed in the number of studies conducted in the field of distance education at Gazi University. Although Anadolu University is the biggest university in the field of distance education in Europe and the second biggest in the World in terms of the total number of registered students, it ranks the second in Turkey in terms of the total number of Master's Theses in the related field. Lastly, when the research interests in the theses were examined, it was seen that success, attitude, effectiveness and satisfaction were the most common variables used in the theses.

In the light of the findings obtained in the present study, the following implications could be drawn for future research.

- Researchers could make use of the present findings in their future studies in the field of distance education and develop a comprehensive understanding in this field.
- It was seen that quite a few Master's Theses were based on theoretical grounds. Supervisors could encourage their students to base their theses on theoretical grounds. In this way, theses based on more powerful grounds could be produced.
- Examining the theses included in the scope of the present study revealed that the participants in these theses were mostly undergraduate students. Future research could be conducted with a wider variety of participants in the field of distance education.
- It was seen that the Master's Theses were mostly conducted using quantitative designs. However, increasing the number of studies using the mixed method, which includes combined use of qualitative and quantitative designs, could help obtain more precise and generalizable results.
- It was seen that most of the studies conducted in the field of engineering were design development studies and that a system/software was designed in these theses. In design development studies, conducting analyses by gathering qualitative and quantitative data could scientifically support the design developed.

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Using Electronic Information Resources Centers by Faculty Members at University Education: Competencies, Needs and Challenges

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ABSTRACT
This study aimed at investigating the factual situation of electronic information resources centers to faculty members at university education. Competencies that faculty members should possess regarding this issue were determined. Also their needs for (scientific research skills and teaching) were assessed. In addition, problems that hinder their use of electronic resources centers were identified. Data obtained were analyzed statistically using SPSS in measuring reliability of instruments. Participants of the study were **(655)** faculty members at Saudi Universities (**412** males & **243** females). Results indicated that there were significant differences between male and female at **($\alpha \leq 0.05$)** level. Results also revealed significant differences between members of different ranks at **($\alpha \leq 0.05$)** level, and between academic areas of specializations at **($\alpha \leq 0.05$)** level. Significant differences were also found between faculty members in terms of years of experience in using electronic information resources centers at **($\alpha \leq 0.05$)** level. This study recommends that most Saudi Universities are in need of establishing electronic information resources centers and offering training courses to provide technical support in a way to solve some of faculty members' problems.

Keywords: electronic information resources; faculty members; competencies; needs; challenges**.**

INTRODUCTION
Quality of education offered to students is the success key of any educational institution. Since every student need to be provided by ways to facilitate the essential responses for learning, the educational environment should consist of knowledge, competencies, abilities, motives, teaching methods etc. These aspects are related and greatly affect the whole environment. Thus, the use of electronic information resources centers is a high level individual activity initially assures the provision of many of faculty members needs at universities and help them achieve their competencies.

Surveying the educational developments shows that a number of policies are set to maintain that educationalists need to get along with innovations in the field **(Fahad et al. 2013)**. However electronic information resources centers witnessed many changes until reaching the current level, making development of these centers a continuous process. The history of these centers goes back to classroom library then universities libraries that were developed to include media and non-printed materials where they used to be called comprehensive libraries. Finally, the electronic information resources centers that include all resources and the focus they make to the learning process rather than the teaching process.

Electronic resources centers are characterized by the electronic material they contain which allows access to the biggest possible number of periodicals, reports and statistics in academic fields. They also allow continuous updating to these materials **(Hughes 2013)**. Searching electronic information centers is much easier for faculty members as they enable them to be in continuous contact with the international databases around the world.

Thus, these centers offer a service that facilitates gaining information in a few moments unlike traditional methods that used to take weeks and in some cases months **(Hostager 2014)**. Not only in terms of time, these centers facilitate the direct access to the materials by printing, downloading or sending them by email. Electronic information recourses centers offer a big number of digital information for their users quicker than doing this manually through printed materials (**Andrews and Eade 2013)**. Furthermore, electronic searches help discovery of some information that could not be obtained through traditional methods. The field of scientific research makes good use of these electronic ways as they help facilitate continuous communication among researchers and gain updating to new discoveries (**Taffs and Holt 2013)**. Also, the use of electronic information resources centers improves many learning and teaching processes in addition to extra curricula activities.

Currently educational processes face many problems and challenges due to the so many continuous and competitive developments we witness today. These led to the need of establishing electronic information resources centers to help educationalists get along with new developments. Use of these centers help improve teaching and learning processes in a way to prepare a generation able to face challenges, find solutions using scientific ways based on new and multiple resources. More important, these centers offer better ways of how to employ educational technology effectively to achieve educational goals as they consider learners to be participants unlike traditional methods that consider them only receivers **(Davids et al. 2014)**.

The current study considers investigating the use of electronic information centers in universities and institutions of higher education and finding solutions to problems theat may suffer as prerequisites for distinction in all fields of knowledge. The study investigates also the way faculty members use electronic information centers in conducting scientific research and in their teaching. In addition to the identification of problems that may hinder their effective use of these centers and their needs for better practice. These are for the purpose of developing a framework for helping the faculty members to obtain competencies that maintain their effective use of these centers. This framework will offer electronic educational environment that allow opportunities for practicing self-learning skills and reinforcing research and discovery skills that help faculty members to employ modern ways in designing, developing, implementing and evaluating the courses they teach **(Akaichi 2014)**.

This study seems important in helping faculty members in identifying competencies they need to posses in order to effectively use electronic information resources centers. It will help also identifying types of electronic information resources centers that could be of benefit to the educational process. The current study tries to orient those in charge of Saudi universities towards the importance of establishing electronic information centers in terms of faculty members needs. This study will provide those in charge of electronic information resources centers with challenges that hinder the use of electronic information resources centers **(Solomou et al. 2015)**.

The current study matches the contemporary focus all over the world on the use of electronic information resources centers in universities and all educational institutions. The study tries to identify the way faculty members use these centers at Saudi Universities in conducting their scientific research and in their teaching. The study identifies types of electronic information resources that help faculty members to practice self-learning skills that support research and discovery skills.

Given the important role electronic information resources centers play in improving the work of faculty members **(Wang 2014),** this study asks the following main research question:

What is the factual situation of the use of faculty members at Saudi universities to electronic information resources centers?

This entails a number of sub-questions that can be summarized as follows:

1- What are the competencies faculty members at Saudi universities should posses in order to be able to use electronic information resources centers?
2- What are the needs of faculty members to use electronic information resources centers for?
3- What are the challenges that hinder faculty members at Saudi university from using electronic information resources centers?

HYPOTHESES OF THE STUDY

1- There are significant differences at **($\alpha \leq 0.05$)** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of gender.
2- There are significant differences at **($\alpha \leq 0.05$)** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of academic rank.
3- There are significant differences at **($\alpha \leq 0.05$)** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of academic area of specialization.
4- There are significant differences at **($\alpha \leq 0.05$)** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of number of years of experience.

AIMS OF THE STUDY

1- Identifying competencies faculty members should possess in order to be able to use electronic information resources centers.
2- Identifying how far faculty members' needs are fulfilled regarding the use of electronic information resources centers.
3- Identifying the challenges that might hinder the use of faculty members in these centers.

REVIEW OF LITERATURE

Electronic information resources centers enable faculty members to use multiple resources at the appropriate environment provided by the university. The use of these centers helps faculty members to better attracting students' attention and increasing their interest during learning **(Yessad et al. 2011)**. These centers offer a modern economic model different from traditional one in terms of offering an alternative to provide all classrooms with educational technology. They also contribute to organizing and classifying learning resources which facilitate access of staff members to them **(Thompson et al. 2014)**.

Use of electronic information resources centers helps faculty members in planning and implementing their teaching activities. They allow faculty members access to use them whenever they find appropriate and search for the needed materials without any restrictions. They help to shift from the traditional schedule into a more flexible one in terms of time, teaching methods and media.

Electronic information resources centers aim at the following:

Supporting study course with related electronic materials. **(Hockings et al. 2012)**

- Developing research skills and helping faculty members to encourage research and problem solving skills to their students.
- Supporting students with skills and tools that enable them to adapt with and make use of the quick competitive development in the field of information system**. (Lau et al. 2015)**
- Helping faculty members to use varied teaching methods.
- Helping staff members to exchange their experience for the purpose of developing study courses.
- Allowing opportunities for self-learning.
- Catering for individual differences and meeting students' needs.
- Identifying real attitudes, preferences and aptitudes and potentials of faculty members.
- Helping staff members to guide their students on better ways to obtain information from multiple resources **(Chang et al. 2012)**.

Types of electronic information resources:

First: electronic information resources in terms of coverage and objective manipulation: classified as:

- Electronic information resources related to particular areas of specialization
- Electronic information resources of comprehensive specialization or sometimes known as non-specialized **(Leibowitz 2009)**.
- Electronic information resources general (news, political, informative and televised)

Second: electronic information resources in terms of institution concerns, may be classified as following:

- Electronic information resources belong to commercial institutions **(Hani et al. 2013)**.
- Electronic information resources belong to non-commercial institutions (universities, scientific centers, international and national organizations and projects financed by government or other bodies) **(Tripp 2003)**.

Third: electronic information resources in terms of type of information classified as follows **(Lim et al. 2007)**:

- Bibliographical database.
- Textual numeric database (online, CD-ROMs- magnetic tapes).

Competencies of using electronic information resources centers:

- Identifying electronic information database needed in terms of areas of specialization of faculty members (general and specialized research engines to search websites of publishing of database of electronic information – visiting the location of a university library to view the list of database of electronic information) **(Levy et al. 2011)**.
- Identifying the differences between database of electronic information and the traditional ones: method of setting research variables- identifying number of variables used by faculty members for research-methods of presenting research findings-identifying if the documents are numerated within the database or not-method of presenting summaries of documents **(Al-Busaidi 2013)**.
- Identifying methods of entering database of electronic information according to the following use of acronyms; abbreviated names- of database- use of the term databases and full address of electronic databases- entering websites of universities libraries.
- Identifying the main page of databases of electronic information: name of database- searches-advanced searches- glossary of terms used in storing documents and in giving commands **(Noguerón-Liu 2014)**.
- Identifying strategies of research in electronic information databases: identifying the type of research in electronic database, selection of research terms, typing the research terms in the appropriate columns-choosing the right conjunctions for research terms-choosing the field of research from the list-selecting the date of publication to the needed document-selecting the language of the document-identifying the

needed electronic information about the document- selection of the type of document- selections of other options and identifying type of pictures and needed drawings **(Moreno et al. 2009)**.

- Evaluating results of researching electronic information resources
- Centers: reviewing literature and researching using new terms-
- Quick viewing to titles of articles in order to decide how far they are related to the topic under investigation-saving and printing research results and sending them via email.
- Authorization of references obtained on line: this could be through understanding the abbreviations used in quoting- understanding abbreviations that point to the title of the document under investigation, name of author, date of publication and type of source.
- The ability to use the technical support via the internet and use the guidebook of topics **(Cornelius & Gordon 2009)**.
- Referring to the bibliography in order to select a new document and start searching using different strategy.
- Referring to the main page to perform a new search and using different variables to reach the target information.

Needs of faculty members to use electronic information resources centers:

There are a number of needs and motives that make faculty members use electronic information resources centers. These needs and motives differ from one user to another in terms of the type of electronic information needed **(Abouel enein 2016)**. Needs could be for educational or research purposes, or could be personal or resulting from the surrounding environment. Examples of these needs are: coping with modern developments taking place in academic fields- solving problems regarding academics and conducting scientific research, **(Davids et al. 2015)**. Also, publishing articles - supporting teaching and learning –participation in forums and conferences**.** There are also professional needs related to taking decisions related to work besides personal needs related to learning or entertainment **(Norman & Siminitus 2006)**.

Reasons for establishing electronic information resources centers

There are a number of tasks for electronic information resources centers some of these are: providing electronic information resources related to educational needs, they are useful in developing thinking skills to faculty members and students **(Fahad et al. 2013)**. They are also helpful for faculty members and students as they facilitate reaching required information inside or outside their universities **(Basha et al. 2013)**. Appropriate use of electronic information resources centers acts as a guide to faculty members to help them select and use needed resources **(Dalveren 2014)**.

Factors affecting the use of electronic information resources centers

There are a number of aspects affecting the use of electronic information resources centers. Some of these are: their use, surrounding environment and faculty members. Results from research identified factors affecting the use of these centers related to faculty members as follows: they provide for electronic information and facilitate access to it **Park et al. (2010)**. They allow access to updated information and provide for multi forms of information. There are also some personal factors affecting the use of these centers by faculty members in terms of age, academic rank, area of specialization, years of experience and professional needs **(Cegarra-Navarro and Rodríguez 2012)**.

In sum to what has been mentioned above, there are a number of factors affecting the use of electronic information centers which can be classified into two categories. First, factors related to the use of electronic information resources centers. Second, factors related to the personal traits of the user and surrounding environment **(Korobili et al. 2006)**.

A) Factors related to the use of electronic information resources centers these are:

- The availability of using electronic information resources centers and the range of their modernity (simple or complex- available or unavailable- inside the center or via network- traditional or electronic) **(Pineda-Herrero et al. 2011)**.
- Form of electronic information in the electronic resources centers and easiness of use.
- Cost of using electronic information resources centers.
- Increase of electronic information centers as a result of the revolution of published knowledge **(Hartnett & Koury 2012)**.
- Time: information requires long time to obtain its value.
- Faculty members rely on the ability of these centers to get information and retrieve it afterwards.

B) **Factors related to faculty members (personal factors) (Adnan 2014) These are as follows:**

- Age,
- Academic discipline,
- Academic rank,

- Number of years of experience,
- Desire to use electronic information resources centers,
- Problems hindering the use of electronic information resources centers, and
- Ability, comprehensiveness and appropriateness for conducting deep research **(Marković and Jovanović 2012)**.

Challenges that hinder use of electronic information resources centers

There are a number of problems hindering faculty members from using electronic information resources centers. Some of these challenges and problems are: lack of well-prepared electronic environment **(Sidgreaves et al. 1987)**; lack of cadres of trainers who can train faculty members on using electronic information resource; the rare electronic material that server the university; there is no updating system that could inform about changes and development if different area of specializations; some tools cannot work using Arabic language and require specialized people in language; lack of sills of using electronic information resources centers**;** lack of electronic information resources centers in most Saudi governmental universities, lack of sufficient time for researching electronic information resources centers, lack of electronic information in Arabic and lack of incentives that encourage faculty members to use electronic information resource centers. In addition, lack of appropriate places for conducting scientific research activities, lack of technicians who can provide support to faculty members, lack of needed electronic information **(Dalveren 2014)**, on line information cannot be guaranteed to be there all time and slow downloading is expected **(Abel et al. 2004).**

Research methods and procedures

Population

Population consisted of a group of male and female faculty members in some Saudi universities. Participants included professors, associate professors, assistant professors, lecturers and demonstrators. Questionnaires were administered to (721) faculty members from governmental Saudi Universities. Out of this (66) participant were eliminated as they provided incomplete data. Final number of participants was (655) faculty members from governmental Saudi universities (412) males and (243) females who were selected from different areas of academic disciplines (medical sciences, applied science and humanities) and from different academic ranks. Data collection lasted for one academic year 2015. Numbers of years of experience was also a factor considered in selecting population as shown in the following tables.

Table 1: *Distribution of population in terms of gender and academic rank.*

Scientific Degree							
Gender	**prof**	**Co-professor**	**Assistant Prof**	**lecturer**	**Teaching Assistant**	**Total**	**%**
Males	**52**	**98**	**116**	**69**	**77**	**412**	**%62.91**
Females	**33**	**38**	**64**	**53**	**55**	**243**	**%37.09**
Total	**85**	**136**	**180**	**122**	**132**	**655**	**%100**
%	**%12.98**	**%20.76**	**%27.48**	**%18.63**	**%20.15**	**%100**	**%**

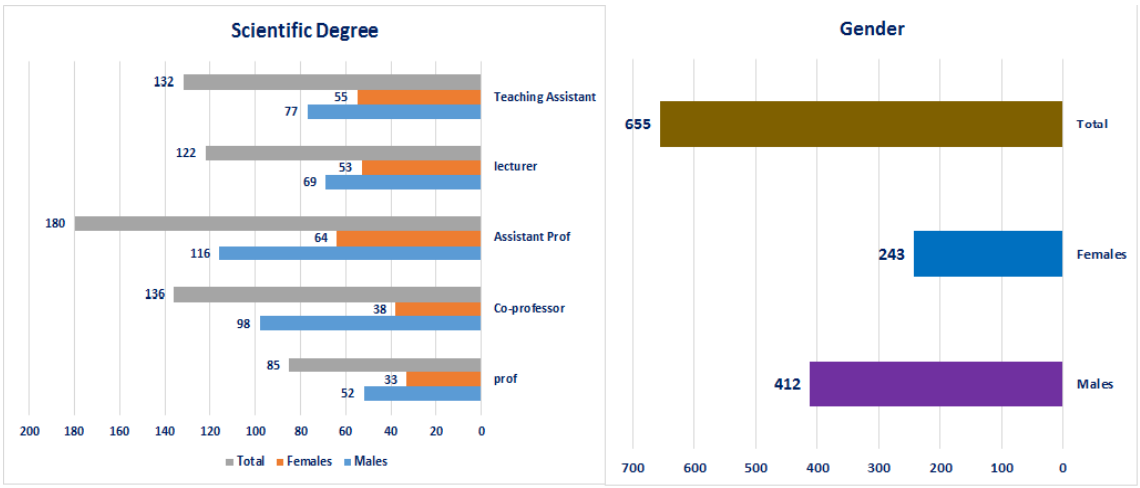

Figure 1. Distribution of population in terms of gender and academic position.

Table 2:*Distribution of population in terms of area of academic specialization and number of years of experience*

Years of Experience								Academic Specialization					
Gender	Less than 5 years to 5 years	From 6 years to 10 years	From 11 years to 15 years	From 16 years to 20 years	From 21 years to 25 years	Total	%	Gender	Humanities Sciences	Applied Sciences	Health Sciences	Total	%
Males	138	114	98	31	10	391	%59.69	Males	133	119	104	356	%54.35
Females	95	77	61	23	8	264	%40.31	Females	105	108	86	299	45.64 %
Total	233	191	159	54	18	655	%100	Total	238	227	190	655	%100
%	35.57	29.16	24.27	8.24	2.76	%100		%	36.33	34.5	29.17	%100	

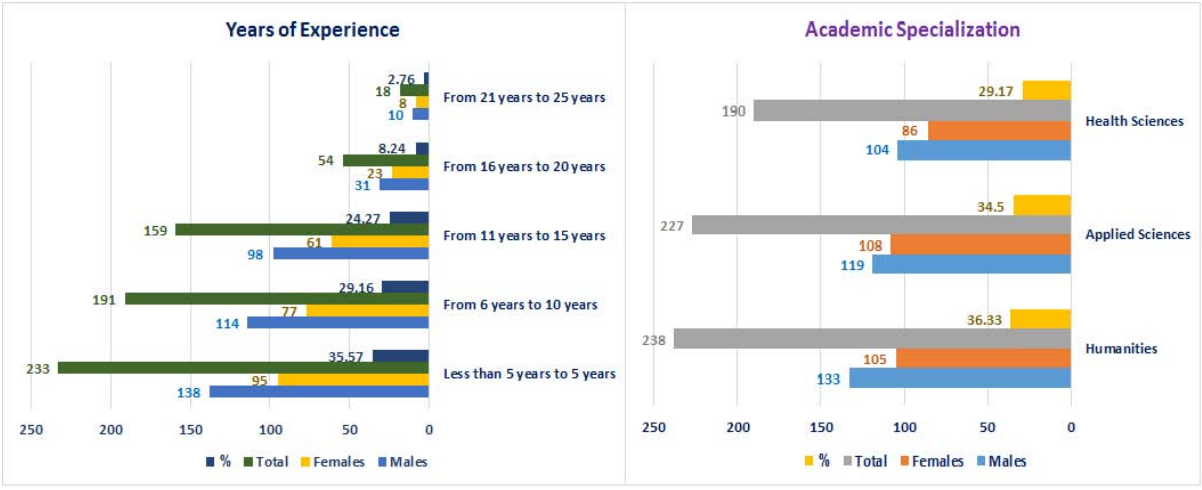

Figure 2. Distribution of population in terms of area of academic specialization and number of years of experience.

RESEARCH METHOD

Descriptive analytic method was used to obtain data from research related to the problem of the current study. This is for the purpose of investigating the factual situation of electronic information resources centers in Saudi universities and identifying problems facing them.

RESEARCH INSTRUMENT

Procedures of preparation of a questionnaire of investigating the factual situation of the use of faculty members of electronic information resources centers at Saudi universities.

- Review of literature related to electronic information resources centers and types of electronic information in general.
- Review of findings of research from international journals and conference related to electronic information resources centers in particular.
- Interviewing a number of faculty members in the field of educational technology and electronic learning in order to obtain their views on types of electronic information, problems, competencies, roles, needs of faculty members and affecting factors. In terms of these steps a questionnaire was developed under three categories as follows:
- **Category one:** dealt with competencies that should be possessed by faculty members to use electronic information resources centers. These competencies were phrased in (10) items with brief explanatory details. Reponses were guided by a scale of five options (strongly agree, agree, neutral, disagree and strongly disagree).
- **Category two:** Dealt with assessing needs of staff members of using electronic information resources centers, these were phrased in (23) items. Reponses were guided by a scale of five options (often, always, sometimes, rarely, never).

- **Category three:** This part dealt with the problems that hinder faculty members from using electronic information resources centers phrased in (11 items). Reponses were guided by a scale of five options (often, always, sometimes, rarely, never).

Validity of the questionnaire was measured, procedures are as follows

- **Face validity:** the questionnaire was presented to (23) faculty members specialized in educational technology in some Saudi universities to obtain views on appropriateness and any required modifications.
- Reliability of the questionnaire was measured in terms of a number of procedures as follows. The questionnaire was administered to a group of (23) male and female faculty members in some Saudi universities. Alpha Crookback formula was calculated and reliability reached (0.88).
- **Application of the questionnaire:** it was administered to (655) faculty members from some governmental Saudi Universities.
- **Statistical analysis:** the researcher used SPSS program to measure (mean scores- frequencies- deviations from mean scores- standard of error estimate- differences between mean scores) and Alpha Crookback formula and (Chi square) variables of (gender, degree- number of years of experience- academic areas of specializations) were considered.

DATA ANALYSIS

The viewpoints of research population from faculty members of some Saudi universities were investigated through the use of a questionnaire in order to verify hypotheses of the research and answer its questions.

First: presentation of data: This study aimed at verifying a number of hypotheses through statistical analysis to data obtained from participants. Views of participants around most important competencies needed by faculty members to use electronic information resources centers, how far faculty members are in need for these centers in their teaching and problems hindering the use of these centers were investigated. Results in terms of the research hypotheses are as follows:

First hypothesis: there is a significant difference at **($\alpha \leq 0.05$)** level in the use of faculty members of electronic information resources centers at Saudi universities in terms of gender.

Results related to the first research question 'What are the competencies faculty members at Saudi universities should posses in order to be able to use electronic information resources centers?

In order to answer the first question, statistical data analysis for mean scores, standard deviations and variance for (10) main competencies. Views of participants (412 males and 243 females) were investigated regarding the importance of competencies of using electronic information resources centers through a five scale identifying their responses to questionnaire items. This included (strongly agree- agree- neutral- disagree- strongly disagree).

Table 3:*Shows mean scores and standard deviations for competencies of faculty members in using electronic information resources centers.*

Competencies : Male & Female											
Male & Female		**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**
Males	**N Valid**	**412**	**412**	**412**	**412**	**412**	**412**	**412**	**412**	**412**	**412**
	Mean	**4.135**	**4.017**	**4.114**	**4.092**	**3.990**	**4.143**	**4.186**	**4.029**	**4.080**	**4.031**
	Std. Deviation	**.910**	**.980**	**.911**	**.949**	**1.015**	**.931**	**.954**	**1.000**	**1.114**	**1.148**
	Variance	**.828**	**.961**	**.831**	**.901**	**1.032**	**.868**	**.911**	**1.002**	**1.242**	**1.320**
Females	**N Valid**	**243**	**243**	**243**	**243**	**243**	**243**	**243**	**243**	**243**	**243**
	Mean	**4.181**	**3.987**	**4.148**	**4.131**	**4.323**	**4.020**	**4.205**	**3.983**	**4.142**	**4.024**
	Std. Deviation	**.833**	**.933**	**.839**	**.837**	**.8339**	**.9290**	**.7917**	**1.003**	**.7291**	**.9488**
	Variance	**.694**	**.872**	**.705**	**.702**	**.695**	**.863**	**.627**	**1.008**	**.532**	**.900**

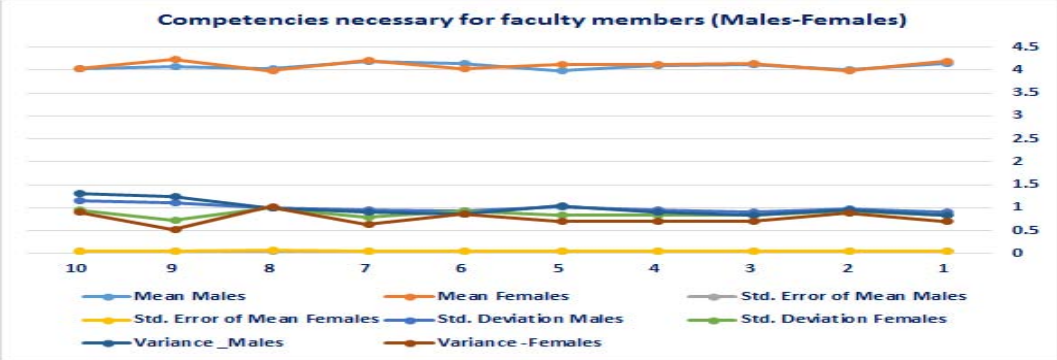

Figure 3. Shows mean scores and standard deviations for competencies of faculty members in using electronic information resources centers.

Results indicated that mean scores of females were (4.110) with standard deviation of (1.113) and a range of variance of responses at (1.241) in terms of the total score of responses. This revealed that there are significant differences **($\alpha \leq 0.05$)** level in favor of females. Variance came in favor of females as results of variance were low regarding males. The competency of setting strategies of researching electronic databases was considered the most important one followed by authorization of references obtained on line, then using specialized research engines for searching electronic information resources centers. Degree of variance in males responses were higher than females responses.

Results related to the second question: 'What are the needs of faculty members to use electronic information resources centers?'
In order to answer this question, views of participants (412 males and 243 females) on the needs of faculty members for using electronic information resources centers were investigated through (23) questionnaire items requiring respondents to choose out of five scale measuring system (often- always- sometimes- rarely- never).

Table 4: *Shows mean scores and standard deviations for the needs of faculty members to use electronic information resources centers.*

Needs : Male & Female																								
Male & Female		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
Males	N Valid	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412	412
	Mean	3.735	3.708	3.679	3.684	3.689	3.895	3.939	3.919	3.808	3.788	3.898	3.9903	4.0097	3.8519	3.7354	3.7621	4.0146	4.1214	4.1092	4.1044	4.1311	4.2087	4.186
	Std. Deviation	1.202	1.191	1.166	1.248	1.246	1.079	1.007	1.016	1.039	1.101	1.034	.92539	.94104	1.0670	1.1716	1.1906	1.0532	.97153	.92556	.9339	.90272	.84871	.913
	Variance	1.44	1.419	1.362	1.560	1.553	1.164	1.016	1.03	1.080	1.213	1.070	.856	.886	1.139	1.373	1.418	1.109	.944	.857	.872	.815	.720	.834
Females	N Valid	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243
	Mean	4.032	4.123	4.057	4.197	4.292	4.045	3.995	3.658	3.271	3.234	4.024	4.053	4.032	4.070	4.152	4.362	4.316	4.242	4.222	4.053	4.131	4.160	4.123
	Std. Deviation	.948	.798	.785	.740	.6174	.858	.860	1.103	1.276	1.294	1.075	1.037	.9743	.8902	.9433	.7219	.8346	.8046	.9181	.9366	.9040	.8689	.9052
	Variance	.900	.638	.617	.548	.381	.738	.740	1.218	1.628	1.676	1.156	1.076	.949	.793	.890	.521	.697	.647	.843	.877	.817	.755	.819

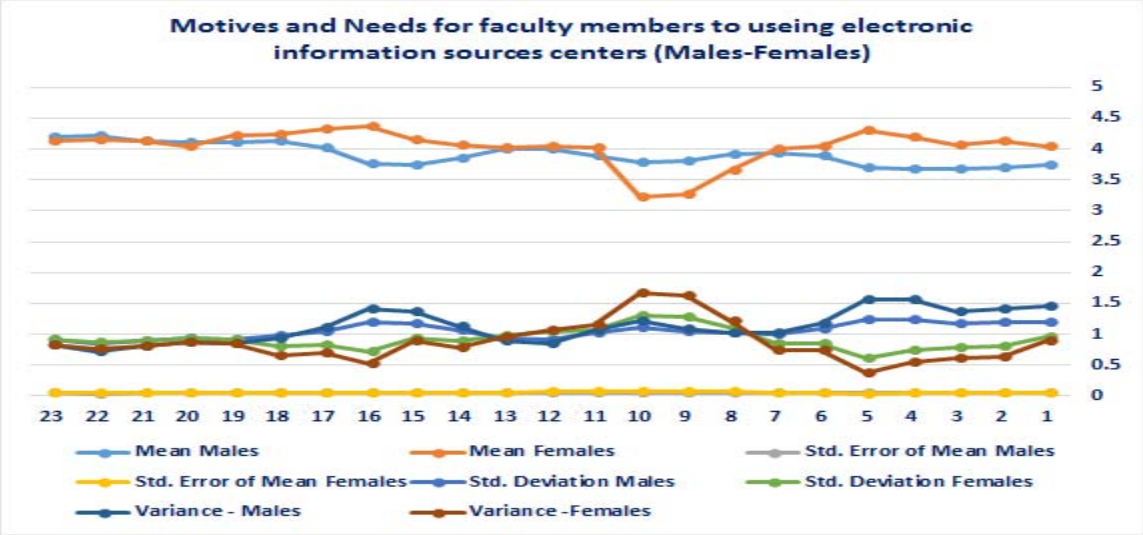

Figure 4. Shows mean scores and standard deviations for the needs of faculty members to use electronic information resources centers.

Results indicate that there are significant differences between males and females at **($\alpha \leq 0.05$)** in favor of females as their mean score was (4.036) with standard deviation of (0.942) and degree of variance of (1.031). Mean score of males was (3.902) with standard deviation of (1.015) and degree of variance of (0.903). Thus, the degree of variance between males was higher than degree of variance between females. This resulted in the significant differences in favor of females. Needs related to teaching could be classified in terms of importance as follows: questionnaire item stating 'allowing opportunities for self-learning' came to be of most important, followed by 'catering for individual differences and meeting students' needs, then continuous support of teaching and learning and authoring, followed by discovering students' potentials and finally developing students' abilities to reach information using various resources.

Results related to the third question' What are the challenges that hinder faculty members at Saudi university from using electronic information resources centers?

In order to answer this question, views on participants (412 males and 243 females) were investigated regarding challenges facing them in using electronic information resources centers through (11) items to investigate the challenges facing faculty members in using electronic information resources centers, with five scale measure requiring a choice among: (often- always- sometimes-rarely- never). This is illustrated in Table 5 & Figure 5 below.

Table 5: *Shows mean scores and standard deviations for challenges facing faculty members (males and females) in using electronic information resources centers.*

Challenges : Male & Female													
Male & Female		M & F	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Males	N Valid	412	412	412	412	412	412	412	412	412	412	412	412
	Mean	1.000	3.927	4.002	4.101	3.915	4.014	4.068	3.747	3.893	3.941	3.737	3.686
	Std. Deviation	.000	.951	.926	.822	.998	.946	.9308	1.096	1.061	1.056	1.145	1.192
	Variance	.000	.905	.859	.676	.998	.895	.866	1.201	1.127	1.116	1.313	1.422
Females	N Valid	243	243	243	243	243	243	243	243	243	243	243	243
	Mean	2.000	3.642	3.679	3.831	3.802	3.790	3.860	3.613	3.818	4.041	3.975	3.786
	Std. Deviation	.000	1.232	1.176	1.098	1.053	1.072	1.115	1.167	1.164	1.007	.966	1.169
	Variance	.000	1.520	1.384	1.207	1.110	1.150	1.245	1.362	1.356	1.015	.933	1.367

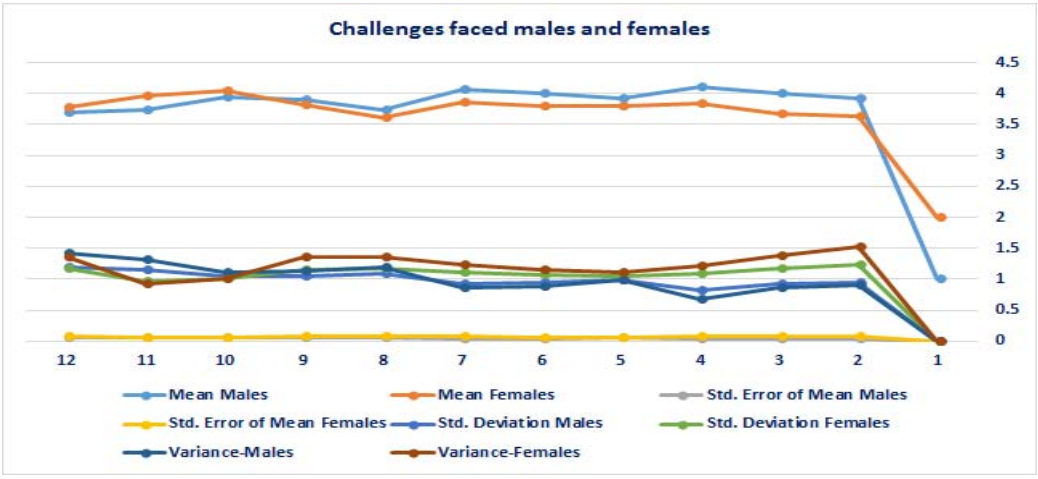

Figure 5. Shows mean scores and standard deviations for challenges facing faculty members (males and females) in using electronic information resources centers.

Results indicate that there are significant differences at **($\alpha \leq 0.05$)** in favor of males as their mean score was (3.911) with standard deviation of (0.995) and degree of variance of 0.994. For females, their mean score was (3.803) with standard deviation of (1.153) and degree of variance of (1.323). This shows that there are significant differences in favor of males as their mean scores representing the challenges facing them as follows: there are no electronic information resources centers in their universities. Furthermore, it was revealed that there are no electronic information resources centers serving their universities. Then, the poor use of electronic information resources centers, lack of specialists to train faculty members to use these centers and finally faculty members are not encouraged to use these centers.

D- Results related to the variable of gender (male and female) and its relationship with variables of the study: academic rank, academic area of specialization and number of years of experience. In order to examine this relationship, data were treated statistically to investigate correlation of gender, differences between males and females in terms of academic rank, academic area of specialization and number of years of experience. as shown in Table 6 & Figure 6

Table 6: *Shows mean scores and standard deviations for the variable of gender and its correlation with variables of the study: academic rank, academic area of specialization and the number of years of experience.*

Comparison between the study variables : Gender				
Gender		Scientific Degree	Academic Specialization	Years of Experience
Males	N Valid	412	412	412
	Mean	3.3471	1.9466	2.3010
	Std. Deviation	1.30446	.82660	1.16381
	Variance	1.702	.683	1.354
Females	N Valid	243	243	243
	Mean	2.0823	1.8930	1.8519
	Std. Deviation	.84392	.76929	.83978
	Variance	.712	.592	.705

The above table shows that differences between mean scores related to academic rank, academic area of specialization and number of years of experience came in favor of males and were significant at **($\alpha \leq 0.05$)** level**.**

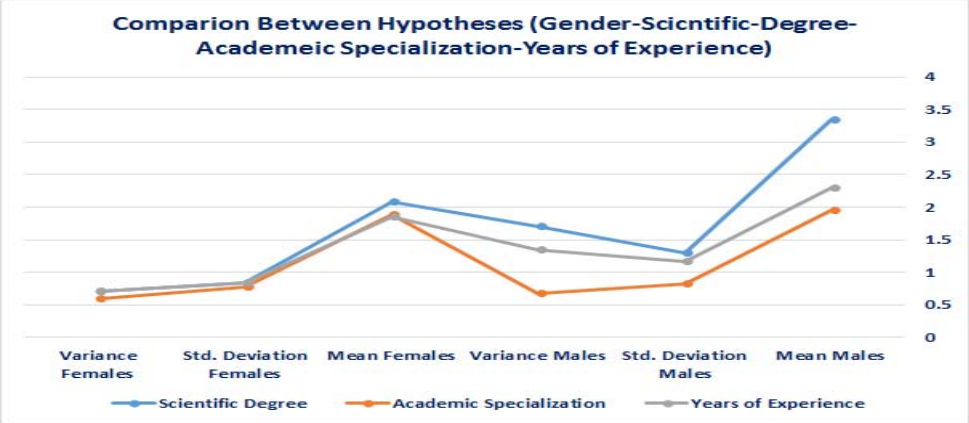

Figure 6. Shows mean scores and standard deviations for the variable of gender and its correlation with variables of the study: academic rank, academic area of specialization and number of years of experience.

Comparisons of standard deviations to the mean scores between males and females show that deviations were higher to males than females. This indicated the correlation between gender and the variables of the study: academic area of specialization and number of years of experience. Degree of variance is higher regarding males more than females.

Second hypothesis: There are significant differences at **($\alpha \leq 0.05$)** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of academic rank. In order to verify the second hypothesis data were treated in three stages related to the question of the study (competencies- needs-challenges) and details are as follows:

Results related to the first question: What are the competencies faculty members at Saudi universities should posses in order to be able to use electronic information resources centers?

Results of investigating views of faculty members participating in this study in terms of academic rank (132 demonstrator- 122 lecturer-180 assistant professors-136 associate professors and 85 professors) regarding competencies needed for using electronic information resources centers. They were asked to respond to (10) questionnaire items and were asked to select among five scale measure (strongly agree, agree, neutral, disagree and strongly disagree). As shown in Table 7 & Figure 7

Table 7: *Shows mean scores and standard deviations of academic rank and its correlation with competencies needed for using electronic information resources centers.*

Competencies : Scientific Degree											
Scientific Degree		1	2	3	4	5	6	7	8	9	10
Teaching Assistant	N Valid	132	132	132	132	132	132	132	132	132	132
	Mean	4.121	3.916	4.053	4.098	4.090	4.045	3.992	3.833	4.075	3.886
	Std. Deviation	.9493	.9888	.9909	.8636	.8948	.9639	1.022	1.140	.9777	1.109
	Variance	.901	.978	.982	.746	.801	.929	1.046	1.300	.956	1.231
lecturer	N Valid	122	122	122	122	122	122	122	122	122	122
	Mean	4.163	4.032	4.065	4.065	4.049	4.172	4.311	4.106	4.295	4.163
	Std. Deviation	.8367	.9615	.9157	.9769	.9778	.9332	.8037	.8889	.8099	.9565
	Variance	.700	.925	.839	.954	.956	.871	.646	.790	.656	.915
Assistant Prof	N Valid	180	180	180	180	180	180	180	180	180	180
	Mean	4.244	4.011	4.222	4.050	4.056	4.133	4.288	4.138	4.211	4.088
	Std. Deviation	.7953	.9092	.7212	.8734	.9497	.8548	.7873	.9499	.8906	.9819

	Variance		.633	.827	.520	.763	.902	.731	.620	.902	.793	.964
Co-professor	N	Valid	136	136	136	136	136	136	136	136	136	136
	Mean		4.125	4.080	4.198	4.220	3.992	4.022	4.117	3.808	3.985	3.897
	Std. Deviation		.9304	.9031	.7680	.8665	.9698	1.007	.9741	1.078	1.161	1.194
	Variance		.866	.816	.590	.751	.941	1.014	.949	1.163	1.348	1.426
prof	N	Valid	85	85	85	85	85	85	85	85	85	85
	Mean		4.035	3.976	4.011	4.117	3.988	4.117	4.258	4.211	4.117	4.141
	Std. Deviation		.9315	1.123	1.117	1.016	1.005	.9182	.8612	.8031	1.127	1.166
	Variance		.868	1.261	1.250	1.034	1.012	.843	.742	.645	1.272	1.361

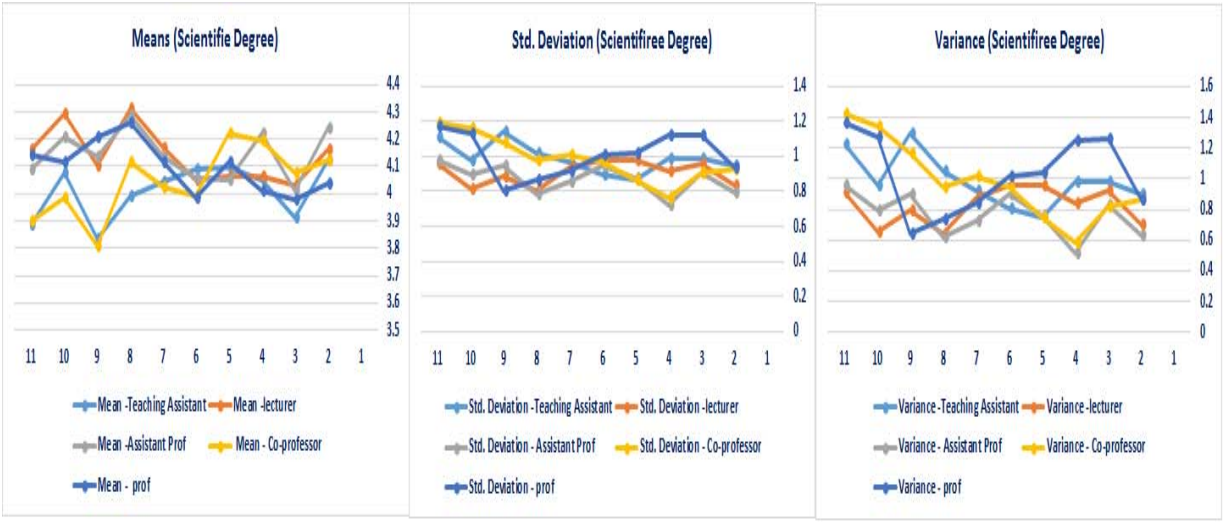

Figure 7. Shows mean scores and standard deviations of academic rank and its correlation with competencies needed for using electronic information resources centers.

Statistical analysis of data shows significant differences among academic ranks at **($\alpha \leq 0.05$)** as mean score of demonstrators was (4.010) with standard deviation of (0.893) and degree of variance of (0.801). Mean score of lecturers was (4.142) with standard deviation of (1.64) and degree of variance of (1.362). Mean score for assistant professors was (4.132) with standard deviation of (0.942) and degree of variance of (0.928). Mean score for professors was (4.088) with standard deviation of (0.904) and degree of variance of (0.816). The above results indicated that there are significant differences among different academic ranks in terms of: (demonstrators- lecturers- assistant professors-professors). This result is assured since the competency of identifying electronic information databases in terms of the academic area of specialization came on top, then authorization of on line references followed by evaluation of search results, after that identifying components of main page of electronic databases and finally, the ability to use direct technical support and topics guide on line.

Results related to the second question: What are the needs of faculty members to use electronic information resources centers for?

Investigation of views of faculty members regarding needs of using electronic information resources centers in terms of academic rank (132 demonstrators- 122 lecturers-180 assistant professors-associate professors -136 associate professors- 82 professors) through (23) items on a questionnaire requiring them to choose among five options (often- always-sometimes-rarely- never).

Table 8: *Shows mean scores and standard deviations of academic ranks and their correlation with needs of using electronic information resources centers.*

Needs : Scientific Degree																								
Scientific Degree		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Teaching Assistant	N Valid	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
	Mean	3.583	3.719	3.825	3.734	3.742	4.068	4.045	3.954	3.681	3.848	4.037	4.03	4.053	3.916	3.833	3.803	4.2955	4.272	4.280	4.189	4.181	4.181	4.212
	Std. Deviation	1.198	1.167	.9999	1.144	1.169	.8666	.915	.9235	1.086	1.142	1.058	1.03	.9435	1.026	1.120	1.142	.83564	.865	.849	.839	.9148	.836	.838
	Variance	1.436	1.364	1.000	1.311	1.368	.751	.838	.853	1.180	1.305	1.121	1.07	.890	1.054	1.254	1.304	.698	.749	.722	.704	.837	.700	.703
lecturer	N Valid	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122
	M	4.082	4.090	3.967	4.114	4.098	4.008	3.745	3.803	3.582	3.401	3.918	4.06	4.065	4.008	4.082	4.147	3.9016	3.868	4.057	3.729	3.991	4.041	4.016
	Std. Deviation	.905	.8431	.9528	.8738	.9128	.9045	1.016	1.118	1.225	1.283	1.056	.906	.8789	.9315	.932	.9151	1.0318	.995	.956	.953	.9748	.903	.987
	Variance	.820	.711	.908	.764	.833	.818	1.034	1.250	1.501	1.647	1.117	.822	.773	.868	.869	.838	1.065	.991	.914	.910	.950	.816	.975
Assistant Prof	N Valid	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
	Mean	4.077	4.105	3.944	4.061	4.161	3.844	3.866	3.566	3.305	3.216	3.961	4.05	3.988	3.933	4.000	4.388	4.3444	4.211	4.161	4.227	4.183	4.266	4.100
	Std. Deviation	.893	.815	.9075	.9164	.8198	1.018	.993	1.143	1.320	1.274	1.064	.993	1.041	1.044	1.118	.6962	.80725	.852	.946	.895	.842	.829	.940
	Variance	.798	.665	.824	.840	.672	1.037	.988	1.308	1.744	1.623	1.133	.986	1.084	1.091	1.251	.485	.652	.726	.896	.803	.709	.688	.884
Co-professor	N Valid	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136
	Mean	3.772	3.727	3.727	3.897	3.838	3.977	4.073	3.845	3.764	3.713	3.897	3.95	4.066	3.911	3.794	3.720	3.9926	4.316	4.183	4.139	4.169	4.198	4.308
	Std. Deviation	1.264	1.232	1.176	1.097	1.168	1.057	.866	1.060	1.027	1.114	1.090	.949	.9124	1.021	1.129	1.239	1.0988	.875	.904	.990	.86	.823	.873
	Variance	1.600	1.518	1.385	1.204	1.366	1.118	.750	1.124	1.055	1.243	1.189	.902	.833	1.044	1.276	1.536	1.207	.766	.818	.980	.749	.679	.763
prof	N Valid	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
	Mean	3.541	3.458	3.482	3.317	3.505	3.870	4.152	4.152	3.929	4.000	3.882	3.91	3.882	3.882	3.623	3.600	3.9412	4.094	4.011	4.047	4.082	4.247	4.200
	Std. Deviation	1.314	1.286	1.287	1.521	1.411	1.203	.919	.8238	.8561	.8997	.9438	.928	.9438	1.016	1.224	1.283	1.1685	.971	.957	.924	.953	.911	.870
	Variance	1.727	1.656	1.657	2.315	1.991	1.447	.845	.679	.733	.810	.891	.862	.891	1.034	1.499	1.648	1.366	.943	.917	.855	.910	.831	.757

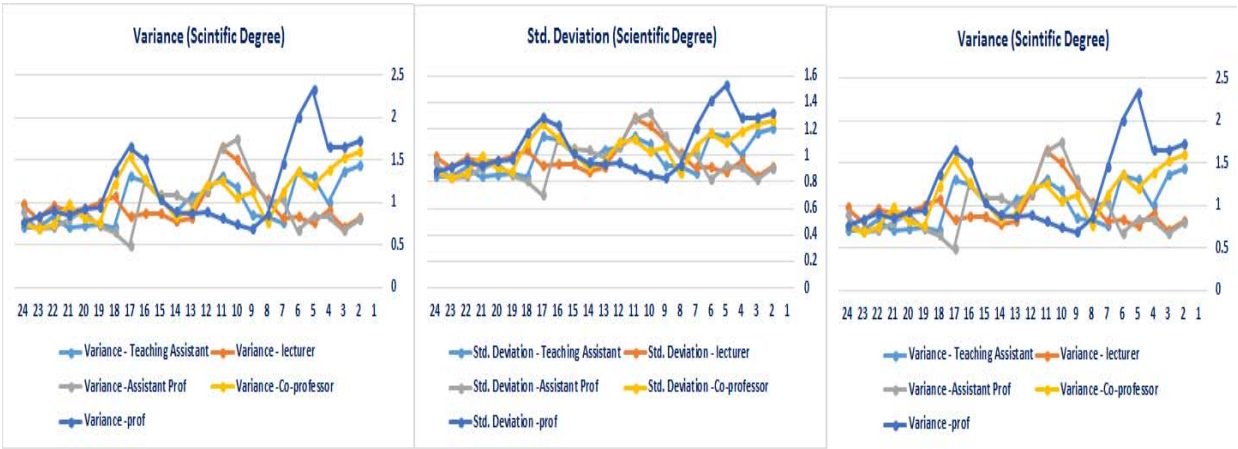

Figure 8. Shows mean scores and standard deviations of academic ranks and their correlation with needs of using electronic information resources centers.

Data analysis revealed that there are significant differences among academic ranks at **($\alpha \leq 0.05$)** level, since mean score of demonstrators was (3.977) with standard deviation of (1.013) and degree of variance of (1.041), for lecturers, their mean score was (3.907) with standard deviation of (1.001) and degree of variance of (1.023),

mean scores of assistant professors was (3.815) with standard deviation of (1.180) and degree of variance of (1.311), mean scores of associate professor was (4.120) with standard deviation of (0.819) and degree of variance of (0.672) and the mean score of professors was (3.861) with standard deviation of (1.016) and degree of variance of (0.943). This is revealed since the item of using and learning at the appropriate times came on top, then discovery of potentials and aptitudes, followed by supporting preparation and implementation of lectures, then providing an economic alternative to save costs of preparation of classrooms with technologies and finally came developing students' abilities to obtain information from multi-sources.

Results related to the third question: What are the challenges that hinder faculty members at Saudi university from using electronic information resources centers?

Statistical analysis of views of participants in terms of academic ranks (132 demonstrators- 122 lecturers-180 assistant professors-associate professors -136 associate professors- 82 professors) around challenges facing them in using electronic information resources centers were investigated through questionnaire items requiring them to select among five options (often- always-sometimes-rarely- never).

Table 9: S*hows mean scores and standard deviations of academic ranks and their correlation with challenges of using electronic information resources centers.*

Challenges : Scientific Degree												
Scientific Degree		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Teaching Assistant	N Valid	132	132	132	132	132	132	132	132	132	132	132
	Mean	3.507	3.621	4.136	3.939	4.022	3.909	3.863	3.848	4.159	4.022	4.037
	Std. Deviation	1.257	1.207	.9144	1.075	.9202	1.029	1.046	1.066	.7895	.8949	.9197
	Variance	1.580	1.458	.836	1.157	.847	1.060	1.096	1.137	.623	.801	.846
lecturer	N Valid	122	122	122	122	122	122	122	122	122	122	122
	Mean	3.844	3.868	3.762	3.762	3.918	4.000	3.598	3.647	4.147	3.934	4.082
	Std. Deviation	1.060	1.075	1.091	1.135	1.017	1.020	1.118	1.219	.8969	.9936	.9144
	Variance	1.124	1.156	1.191	1.290	1.035	1.041	1.251	1.486	.804	.987	.836
Assistant Prof	N Valid	180	180	180	180	180	180	180	180	180	180	180
	Mean	3.983	3.950	3.977	3.811	3.827	4.005	3.594	3.916	3.744	3.572	3.211
	Std. Deviation	.9715	.9470	.9451	.9559	1.061	1.038	1.132	1.132	1.196	1.223	1.341
	Variance	.944	.897	.893	.914	1.127	1.078	1.282	1.284	1.432	1.498	1.799
Co-professor	N Valid	136	136	136	136	136	136	136	136	136	136	136
	Mean	3.963	3.970	4.139	4.000	3.992	4.022	3.757	3.992	3.926	3.823	3.647
	Std. Deviation	.8978	.9579	.7810	.9428	.9775	.9772	1.176	.9775	1.106	1.134	1.226
	Variance	.806	.918	.610	.889	.956	.955	1.385	.956	1.224	1.287	1.504
prof	N Valid	85	85	85	85	85	85	85	85	85	85	85
	Mean	3.705	4.023	3.964	3.858	3.929	4.023	3.705	3.894	4.035	3.905	3.929
	Std. Deviation	1.142	.9509	.9315	1.001	.9974	.9509	1.132	1.069	1.017	1.030	1.088
	Variance	1.305	.904	.868	1.004	.995	.904	1.282	1.143	1.034	1.062	1.185

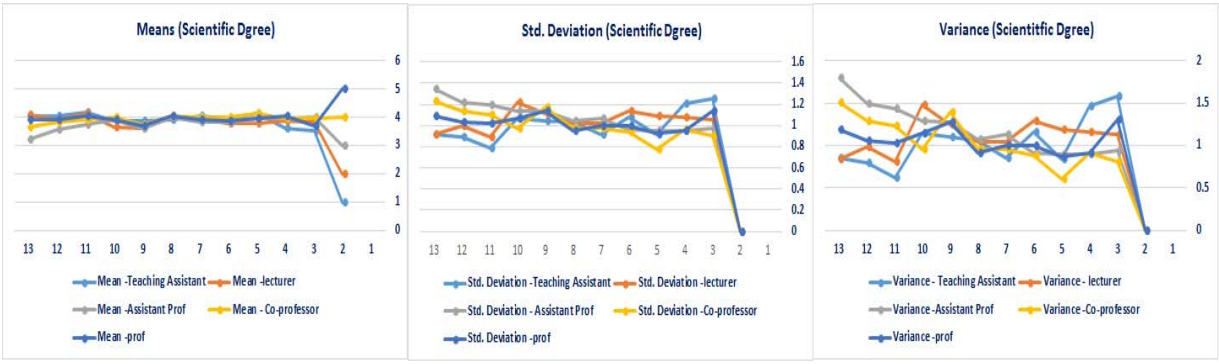

Figure 9. Shows mean scores and standard deviations of academic ranks and their correlation with challenges of using electronic information resources centers.

Analysis of data regarding challenges facing faculty members in using electronic information resources centers in terms of academic ranks showed that there are significant differences among academic ranks at **($\alpha \leq 0.05$)** level, since results from participants were as follows: mean scores of demonstrators was (3.914) with standard deviation of (0.918) and a degree of variance of (1.017); mean scores of lecturers was (3.914) with standard deviation of (1.041) and a degree of variance of (1.133), mean scores of assistant professors was (3.780) with standard deviation of (1.136) and degree of variance of (1.080), mean scores of associate professor was (3.930) with standard deviation of (1.080) and a degree of variance of (1.062), and mean scores of professors was (3.906) with standard deviation of (1.028) and a degree of variance of (1.062). the item of lack of electronic information resources centers came on top then, lack of encouragement to faculty members to use electronic information resources centers followed by unavailability of an appropriate place for electronic information resources centers inside universities then, lack of technical support to solve problems facing faculty members searching electronic resources and finally lack of skills of using electronic information resources centers.

Regarding third hypothesis: There are significant differences at **($\alpha \leq 0.05$)** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of academic area of specialization.

Results related to first question: What are the competencies faculty members at Saudi universities should posses in order to be able to use electronic information resources centers?

The following table shows that results indicated significant differences at **($\alpha \leq 0.05$)** level among academic areas of specialization (238 from humanities- 227 from applied sciences- 190 from health sciences) regarding competencies that faculty members should obtain to use electronic information resources centers through a questionnaire requiring them to respond to different items requiring them to choose from five options (often, always, sometimes, rarely and never).

Table 10: *Shows mean scores and standard deviations of results related to academic area of specialization and correlation with electronic resources centers.*

Competencies : Academic Specialization											
Academic Specialization		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Humanities	**N Valid**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**
	Mean	**4.1008**	**3.9832**	**4.1176**	**4.0630**	**4.0714**	**4.0546**	**4.2017**	**4.0000**	**4.1050**	**3.9916**
	Std. Deviation	**.97127**	**.98498**	**.90172**	**.9679**	**.91353**	**1.0111**	**.86253**	**.98512**	**1.0441**	**1.1288**
	Variance	**.943**	**.970**	**.813**	**.937**	**.835**	**1.022**	**.744**	**.970**	**1.090**	**1.274**
Applied Sciences	**N Valid**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**
	Mean	**4.1894**	**4.0088**	**4.0837**	**4.1630**	**4.0264**	**4.1674**	**4.1938**	**4.0352**	**4.1498**	**4.0352**
	Std. Deviation	**.85408**	**.97305**	**.90576**	**.83869**	**.96359**	**.82986**	**.91562**	**.97245**	**.93815**	**1.0553**
	Variance	**.729**	**.947**	**.820**	**.703**	**.929**	**.689**	**.838**	**.946**	**.880**	**1.114**
S	**N Valid**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**

	Mean	**4.1737**	**4.0316**	**4.1895**	**4.0947**	**4.0158**	**4.0684**	**4.1842**	**4.0000**	**4.1737**	**4.0684**
	Std. Deviation	**.79439**	**.92528**	**.83943**	**.91517**	**.99457**	**.94312**	**.92168**	**1.0591**	**.99008**	**1.0442**
	Variance	**.631**	**.856**	**.705**	**.838**	**.989**	**.889**	**.849**	**1.122**	**.980**	**1.091**

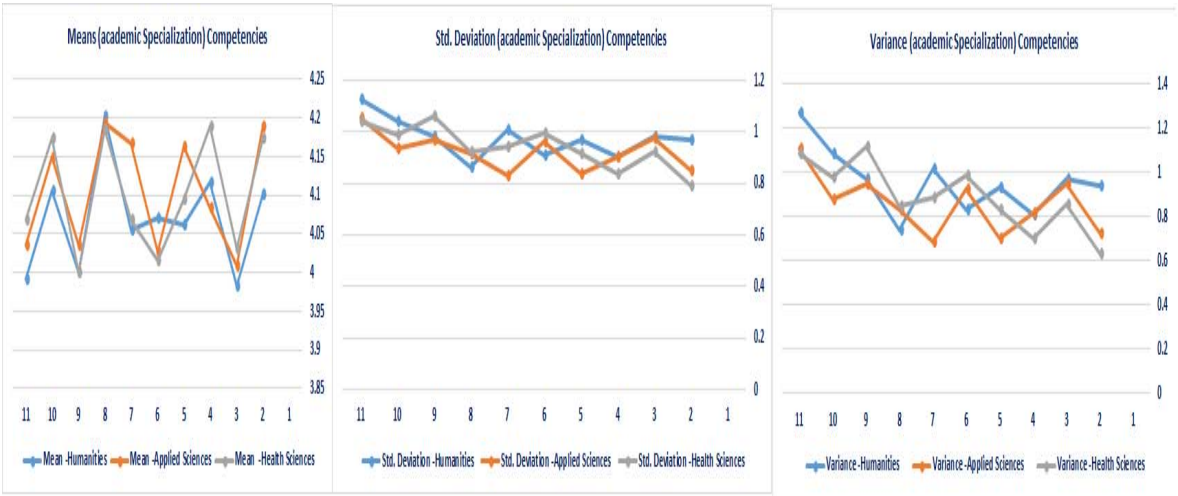

Figure 10. Shows mean scores and standard deviations of results related to academic area of specialization and correlation with electronic resources centers.

Statistical analysis of data regarding competencies needed for faculty members revealed that there are significant differences among faculty members in terms of academic areas of specialization at **($\alpha \leq 0.05$)** details of this could be explained as follows. Mean scores of humanities was (4.068) with standard deviation of (0.967) and a degree of variance of (0.937), mean scores of applied sciences was (4.104) with standard deviation of (1.044) and a degree of variance of (1.090) and mean scores of health sciences was (4.099) with standard deviation of (0.973) and a degree of variance of (0.947). qualitative interpretation of this resulted in the following: selection of the item 'referring to the citation page to choose a new document cam on the top followed by documentation of references obtained on line, then setting a strategy for searching electronic databases, then identifying databases needed in terms of academic area of specialization and finally entering electronic databases using their abbreviated names.

Results related to the second question: What are the needs of faculty members to use electronic information resources centers for?

The following table shows results of statistical analysis of data obtained in terms of academic area of specialization (238 from humanities- 227 from applied sciences- 190 from health sciences) indicating that there are significant differences at **($\alpha \leq 0.05$)** level among academic areas of specialization which determine the need of faculty members to use electronic information re3sources centers based on a questionnaire using five scales (strongly agree- agree- neutral- disagree- strongly disagree).

Table 11: *Shows mean scores and standard deviations of academic areas of specialization and correlation with needs of faculty members to use electronic information resources centers.*

Needs : Academic Specialization																								
Academic Specialization			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Humanities	**N**	**Valid**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**
	Mean		**3.9451**	**3.93238**	**3.9118**	**3.9034**	**4.0126**	**4.0000**	**3.9370**	**3.8403**	**3.5554**	**3.5546**	**3.937**	**4.0084**	**4.0071**	**3.9907**	**3.9924**	**4.0050**	**4.3019**	**4.2521**	**4.2210**	**4.1197**	**4.1193**	**4.2214**	**4.2222**
	Std. Deviation		**1.079**	**1.0492**	**.98757**	**1.0449**	**1.0692**	**.98512**	**.96796**	**1.0868**	**1.1184**	**1.2254**	**1.0792**	**.900**	**.94008**	**1.022**	**1.048**	**1.05**	**.8446**	**.90067**	**.898**	**.899**	**.878**	**.83220**	**.907**
	Variance		**1.166**	**1.101**	**.975**	**1.092**	**1.143**	**.970**	**.937**	**1.181**	**1.404**	**1.574**	**1.165**	**.811**	**.885**	**1.046**	**1.100**	**1.103**	**.716**	**.822**	**.808**	**.809**	**.773**	**.692**	**.824**
Sci.	**N**	**Valid**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**

	Mean	3.775	3.8326	3.7445	3.8899	3.8767	3.9515	3.9692	3.8062	3.6882	3.5599	3.8855	3.947	4.013	3.889	3.810	3.898	3.969	4.101	4.074	4.035	4.118	4.158	4.185
	Std. Deviation	1.127	1.0800	1.1272	1.1214	1.1299	.99215	.94725	1.0207	1.123	1.172	1.0829	1.054	.975	1.000	1.149	1.1223	1.074	.956	.95540	.925	.91115	.85526	.878
	Variance	1.272	1.167	1.271	1.258	1.277	.984	.897	1.042	1.262	1.374	1.173	1.112	.951	1.001	1.322	1.260	1.154	.914	.9100	.857	.831	.727	.771
Health Sciences	N Valid	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
	Mean	3.805	3.8105	3.7947	3.8211	3.8316	3.8895	3.9789	3.8211	3.589	3.610	4.0263	4.005	3.957	4.015	3.942	4.0053	4.073	4.136	4.168	4.005	4.068	4.200	4.063
	Std. Deviation	1.167	1.1202	1.0515	1.1950	1.0852	1.0457	.95373	1.0638	1.177	1.188	.97283	.939	.941	1.005	1.137	1.0665	1.0104	.868	.91160	.97785	.920	.89920	.946
	Variance	1.364	1.255	1.106	1.428	1.178	1.094	.910	1.132	1.386	1.414	.946	.884	.887	1.010	1.293	1.138	1.021	.754	.839	.958	.847	.796	.895

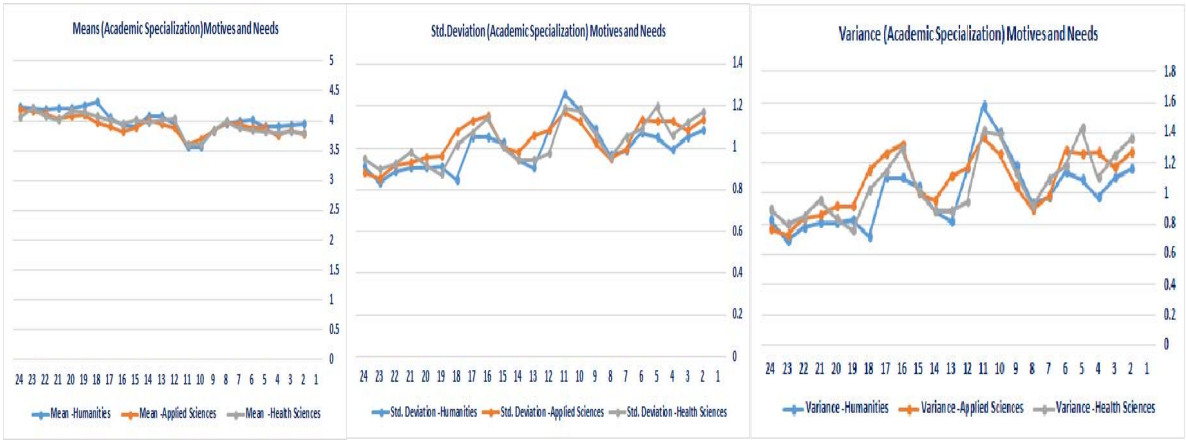

Figure 11. Shows mean scores and standard deviations of academic areas of specialization and correlation with needs of faculty members to use electronic information resources centers.

Data analysis revealed that there are significant differences among faculty members in terms of academic areas of specialization at **($\alpha \leq 0.05$),** details are as follows. Mean scores of participants from humanities were (4.178) with standard deviation of (0.987) and a degree of variance of (0.868) and mean score of participants from applied science was (3.921) with standard deviation of (0.975), mean scores of participants from health sciences was (3.939) with standard deviation of (0.976) and a degree of variance of (0.975). qualitative examination of these results showed that needs of faculty members to' developing research skills , discovery and thinking skills' on top followed by providing students with skills enable them to adapt and make use of competitive developments in information systems. Then' dealing with individual difference', after that, discovering potentials and aptitudes, then using and leaning at the appropriate times, then supporting preparation and implementation of lectures and finally developing students' abilities in obtaining information from different sources.

Results related to the third question: What are the challenges that hinder faculty members at Saudi university from using electronic information resources centers?

The following table shows results of statistical analysis of views of participants on challenges facing faculty members of different areas of specialization in using electronic information resources centers. Results indicate that there are significant differences at **($\alpha \leq 0.05$),** level among academic areas of specialization (238 from humanities- 227 participants from applied sciences- 190 participants from health sciences).

Table 12: *Shows mean scores and standard deviations of different areas of academic specialization and correlation with using electronic information resources centers.*

Challenges : Academic Specialization												
Academic Specialization			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Humanities	**N**	**Valid**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**	**238**
	Mean		**3.806**	**3.962**	**4.016**	**3.907**	**3.974**	**3.970**	**3.852**	**3.789**	**3.953**	**3.785**	**3.701**
	Std. Deviation		**1.065**	**.9865**	**.9138**	**1.010**	**.9890**	**1.032**	**1.039**	**1.150**	**1.064**	**1.117**	**1.235**
	Variance		**1.135**	**.973**	**.835**	**1.021**	**.978**	**1.067**	**1.080**	**1.323**	**1.133**	**1.249**	**1.527**
Applied Sciences	**N**	**Valid**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**	**227**
	Mean		**3.643**	**3.810**	**3.969**	**3.806**	**3.876**	**3.889**	**3.634**	**3.964**	**3.973**	**3.810**	**3.718**
	Std. Deviation		**1.136**	**1.086**	**1.001**	**1.020**	**1.018**	**1.064**	**1.122**	**1.051**	**1.004**	**1.070**	**1.171**
	Variance		**1.292**	**1.181**	**1.003**	**1.042**	**1.038**	**1.134**	**1.260**	**1.105**	**1.008**	**1.145**	**1.371**
Health Sciences	**N**	**Valid**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**
	Mean		**4.052**	**3.868**	**4.021**	**3.910**	**3.942**	**4.136**	**3.578**	**3.842**	**4.015**	**3.894**	**3.757**
	Std. Deviation		**.9580**	**1.038**	**.9082**	**1.032**	**.9930**	**.8862**	**1.209**	**1.091**	**1.051**	**1.073**	**1.138**
	Variance		**.918**	**1.078**	**.825**	**1.066**	**.986**	**.785**	**1.462**	**1.192**	**1.106**	**1.153**	**1.296**

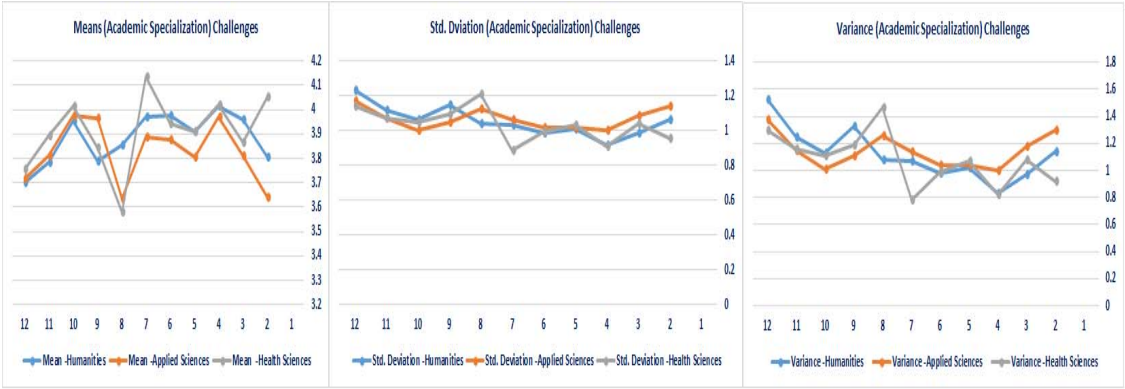

Figure 12. Shows mean scores and standard deviations of different areas of academic specialization and correlation with using electronic information resources centers.

Data analysis regarding challenges facing faculty members revealed that there are significant differences in terms of academic areas of specialization at **($\alpha \leq 0.05$),** level. This is interpreted as follows. Mean score of participants from humanities was (3.883) with standard deviation of (1.064) and a degree of variance of (1.134), mean score of participants from applied science was (3.826) with standard deviation of (1.083) and a degree of variance of (1.181) and mean score of participants from health sciences was (3.910) with standard deviation of (1.032) and a degree of variance of (1.066). The biggest challenges facing faculty members and selected on top of all items was ' lack of encouragement to help faculty members use electronic information resources centers'. followed this ' lack of electronic information resources centers, then lack of electronic information resources serving the university, after that lack of electronic information resources centers in Arabic and finally, lack of modern electronic environment that are supported with modern programs in colleges of the university.

Fourth hypotheses: There are significant differences at **($\alpha \leq 0.05$),** level regarding the use of faculty members at Saudi universities to electronic information resources centers in terms of number of years of experience.

Results related to the first question: What are the competencies faculty members at Saudi universities should posses in order to be able to use electronic information resources centers?

The following table shows statistical analysis of data related to the variable of number of years of experience (from 1-5, from 6-10, from 11-16, from 16-20 and from 21-25) and its correlation with competencies needed to use electronic information resources centers. Results indicated that there are significant differences at **($\alpha \leq 0.05$),** based on the five scales (often- always- sometimes-rarely-never). As described in Table 13 & Figure 13.

Table 13: *Shows mean scores and standard deviations of number of years of experience and its correlation with competencies needed to use electronic information resources centers.*

Competencies : Years of Experience											
Years of Experience		**1**	**2**	**3**	**4.**	**5**	**6**	**7**	**8**	**9**	**10**
Less than 5 years to 5 years	**N Valid**	**233**	**233**	**233**	**233**	**233**	**233**	**233**	**233**	**233**	**233**
	Mean	**4.060**	**3.931**	**4.073**	**4.073**	**4.107**	**3.995**	**4.180**	**4.000**	**4.094**	**3.970**
	Std. Deviation	**.9763**	**1.006**	**.9232**	**.9688**	**.9009**	**1.010**	**.8570**	**.9782**	**1.042**	**1.127**
	Variance	**1.238**	**.968**	**.819**	**1.022**	**1.017**	**1.020**	**1.100**	**1.285**	**1.069**	**1.196**
From 6 years to 10 years	**N Valid**	**191**	**191**	**191**	**191**	**191**	**191**	**191**	**191**	**191**	**191**
	Mean	**4.157**	**3.989**	**4.094**	**4.162**	**4.015**	**4.193**	**4.214**	**3.984**	**4.162**	**4.026**
	Std. Deviation	**.8923**	**.9732**	**.9185**	**.8334**	**.9429**	**.8578**	**.9124**	**1.028**	**.9346**	**1.083**
	Variance	**1.320**	**1.315**	**1.149**	**1.048**	**1.008**	**1.305**	**1.242**	**1.241**	**1.067**	**1.096**
From 11 years to 15 years	**N Valid**	**159**	**159**	**159**	**159**	**159**	**159**	**159**	**159**	**159**	**159**
	Mean	**4.226**	**4.088**	**4.213**	**4.207**	**3.993**	**4.213**	**4.169**	**4.056**	**4.144**	**4.132**
	Std. Deviation	**.7707**	**.8886**	**.8063**	**.7801**	**.9840**	**.7824**	**.9154**	**1.026**	**1.011**	**.9879**
	Variance	**.949**	**1.006**	**.784**	**1.078**	**1.045**	**.699**	**1.604**	**1.205**	**1.082**	**1.210**
From 16 years to 20 years	**N Valid**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
	Mean	**4.240**	**4.018**	**4.111**	**3.759**	**3.888**	**3.814**	**4.203**	**3.981**	**4.222**	**3.907**
	Std. Deviation	**.7251**	**.9613**	**.8831**	**1.148**	**1.176**	**1.133**	**.9977**	**.9212**	**.9450**	**1.153**
	Variance	**.667**	**.924**	**.632**	**.929**	**.792**	**.598**	**.896**	**.803**	**1.157**	**1.261**
From 21 years to 25 years	**N Valid**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
	Mean	**4.388**	**4.388**	**4.444**	**4.111**	**4.277**	**4.222**	**4.333**	**4.166**	**4.222**	**4.277**
	Std. Deviation	**.7775**	**.8498**	**.6157**	**.9633**	**.6691**	**.9428**	**.8401**	**1.098**	**.9428**	**.8947**
	Variance	**.693**	**.997**	**.735**	**1.232**	**1.114**	**1.163**	**1.324**	**1.359**	**1.294**	**1.412**

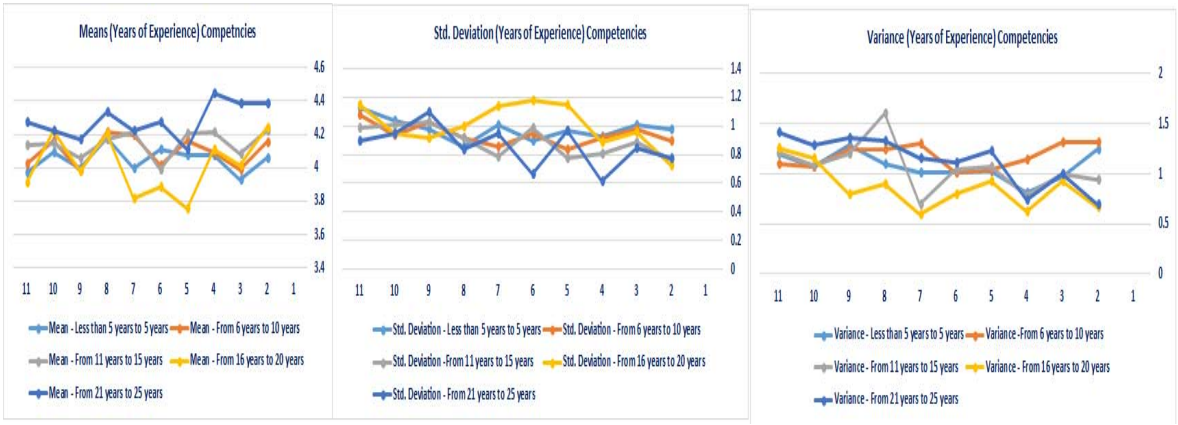

Figure 13. Shows mean scores and standard deviations of number of years of experience and its correlation with competencies needed for faculty members to use electronic information resources centers.

Results indicated that there are significant differences at **($\alpha \leq 0.05$),** level based on the five scales (often, always, sometimes, rarely and never) in terms of number of years of experience interpreted as follows. Mean scores of experience ranged from one year to five was (3.553) with standard deviation of (1.029) and a degree of variance of (1.028), mean scores of number of years of experience ranged from six to ten was (9.099) with standard deviation of (1.068) and a degree of variance of (1.301), mean scores of number of years of experience ranged from eleven to fifteen was (4.014) with standard deviation of (0.930) and a degree of variance of (0.865), mean scores of number of years of experience ranged from sixteen to twenty was (4.144) with standard deviation of (0.972) and a degree of variance of (0.843) and mean scores of number of years of experience ranged from twenty one to twenty five was (4.282) with standard deviation of (0.894) and a degree of variance of (0.801). The most important competency revealed and top selected was ' ability to use direct technical support on line and use of topic guide, followed by setting a strategy for searching electronic databases, then identifying components of the main page of electronic databases, after that entering electronic databases using the abbreviated names, then identifying different types of electronic databases and finally method of arranging variables when searching electronic databases.

Results related to the second questions: What are the needs of faculty members to use electronic information resources centers for?
The following table deals with results from statistical analysis for the variable of number of years of experience (from: 1-5, 6-10, 11-15, 16-20 and 21-25).
And the relationship with needs of faculty members through responding to items of a questionnaire selecting among five scales measure (often- always-sometimes-rarely- never). Results indicated significant differences at ($\alpha \leq 0.05$). As illustrated in Table 14 & Figure 14.

Table 14: *Shows mean scores and standard deviations of number of years of experience and its relation with needs of staff members of using electronic information resources centers.*

		Needs : Years of Experience																						
Scientific Degree		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11	12	13	14	15	16	17	18	19	20	21	22	23
Years to 5	N Valid	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233
	Mean	3.90	3.90	3.89	3.91	3.9*	4.01	3.96	3.83	3.56	3.99	4.03	4.03	3.8	3.90	4.03	4.2*	4.26	4.1*	3.56	4.12	4.1*	4.19	4.23
	Std Deviation	1.08	1.02	.990	1.03	1.09	.999	.984	1.0*	1.23	1.0*	.929	.943	1.01	1.04	1.03	.860	.863	.91*	1.23	.910	.8*8	.832	.880
	Variance	1.1*	1.05	.981	1.0*	1.18	1.00	.968	1.15	1.34	1.53	1.16	.865	.891	1.02	1.10	1.06	.7*1	.7*6	.841	.828	.7*2	.694	.7*6
Years to 10	N Valid	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191	191
	Mean	3.78	3.85	3.*3	3.82	3.89	3.94	3.95	3.86	3.56	3.88	4.04	4.04	3.96	3.80	3.86	4.09	4.14	4.15	3.56	4.12	4.13	4.15	4.14
	Std Deviation	1.15	1.06	1.09	1.12	1.12	.950	.893	.990	1.18	1.04	.983	.939	.9*7	1.12	1.1*	1.04	.928	.936	1.18	.906	.924	.856	.928
	Variance	1.32	1.13	1.20	1.26	1.25	.903	.7*8	.981	1.26	1.39	1.09	.96*	.882	.*99	1.2*	1.38	1.09	.863	.8**	.822	.855	.733	.863
Years to 15	N Valid	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159	159
	Mean	3.85	3.84	3.82	3.99	3.93	3.94	4.08	3.79	3.63	3.62	4.00	3.98	3.98	3.89	3.93	3.98	3.98	4.06	4.11	4.04	4.094	4.21	4.16
	Std Deviation	1.14	1.15	1.08	1.12	1.04	1.03	.885	1.11	1.20	1.18	1.00	1.01	.98*	1.0*	1.19	1.11	1.0*	.994	.930	.950	.939	.902	.894
	Variance	1.30	1.33	1.18	1.25	1.08	1.0*	.7*4	1.23	1.44	1.41	1.01	1.03	.975	1.14	1.41	1.24	1.152	.989	.865	.903	.883	.815	.800
Years to 20	N Valid	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
	Mean	3.*7	3.83	3.83	3.70	3.85	3.*4	3.61	3.70	3.51	3.44	3.85	3.98	3.85	4.18	4.01	4.12	4.03	4.12	4.05	3.81	4.018	4.20	4.00
	Std Deviation	1.16	1.12	1.11	1.29	1.15	1.08	1.13	1.09	1.22	1.29	1.10	.999	.959	.991	1.09	.84*	1.04	.891	.940	1.10	.85*	.8*6	.9*1
	Variance	1.34	1.27	1.23	1.68	1.33	1.1*	1.29	1.19	1.50	1.68	1.22	1.00	.921	.984	1.18	.*19	1.09	.*94	.884	1.21	.*35	.*69	.943
Years to 25	Valid	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	Mean	4.2*	3.**	3.55	3.66	3.38	3.33	3.**	3.94	3.83	4.05	3.*2	3.*2	4.2*	3.88	3.**	4.22	4.11	4.11	4.44	4.33	4.222	4.22	3.83
	Std Deviation	.894	1.11	1.19	1.02	1.24	1.13	1.11	1.05	.923	.8*2	.958	.*51	.894	1.0*	1.06	.8*8	.*58	.6*6	.*83	.766	.808	.*32	.985
	Variance	1.24	1.43	1.05	1.54	1.29	1.24	1.11	.853	1.05	.*61	.918	.565	.801	1.16	1.12	.*71	.5*5	.458	.614	.588	.654	.536	.9*1

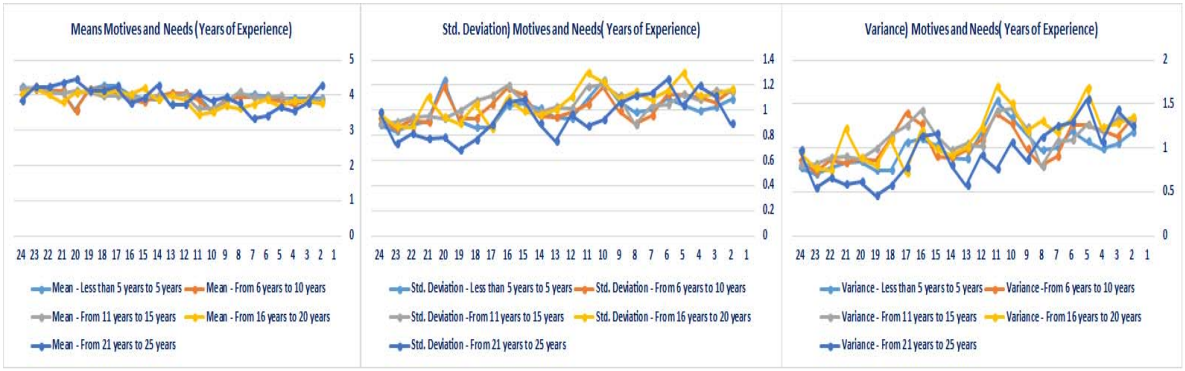

Figure 14. Shows mean scores and standard deviations of number of years of experience and its relation with needs of staff members of using electronic information resources centers.

Results indicated that there are significant differences at **($\alpha \leq 0.05$),** level between different numbers of years of experience. This is explained as follows. The mean score of participants of years of experience was (3.808) with standard deviation of and a degree of variance at (1.013). The mean scores of participants of number of years of experience from 6-10 years was (3.926) with standard deviation of (0.984) and a degree of variance of (0.901). The mean scores of participants of number of years experience from 11- 15 years was (3.957) with standard deviation of (1.98) and a degree of variance a (1.410). Mean scores of participants of number of years of experience from 16-20 was (3.881) with standard deviation of (1.153) and a degree of variance at with standard deviation of (1.381). Mean scores of participants of number of years of experience from 21-25 was (3.929) with standard deviation of (0.931) and a degree of variance at (0.879).

The most prominent needs for electronic information resources centers as follows: 'developing students' abilities in reaching information from multi-sources', followed by discovery of potentials', then' allowing the opportunity for self learning', after that, using and learning at the appropriate time, then, assisting in preparation and implementation of lectures and finally, organizing electronic information resources to facilitate reaching them.
Results related to the third question: What are the challenges that hinder faculty members at Saudi university from using electronic information resources centers?

The following table shows results from statistical analysis to variable of number of years of experience (from: 1-5, 6-10, 11-15, 16-20 and 21-25) and relation with problems that hinder faculty members from using electronic information resources centers through responding to items on a questionnaire requiring selection of five scale measures (often- always- sometimes- rarely- never). Results shows that there are significant differences at ($\alpha \leq 0.05$). As described in Table 15 & Figure 15.

Table 15: *Shows mean scores and standard deviations related to number of years of experience and its relation with problem hindering faculty members from using electronic information resources centers.*

Challenges : Years of Experience												
Years of Experience			1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Less than 5 years to 5 years	N	Valid	233	233	233	233	233	233	233	233	233	233	233
	Mean		3.716	3.952	4.017	3.939	3.905	3.922	3.841	3.794	4.008	3.798	3.759
	Std. Deviation		1.112	.9836	.9048	1.011	1.008	1.009	1.048	1.133	1.033	1.093	1.182
	Variance		1.238	.968	.819	1.022	1.017	1.020	1.100	1.285	1.069	1.196	1.399
From 6 years to 10 years	N	Valid	191	191	191	191	191	191	191	191	191	191	191
	Mean		3.691	3.806	3.942	3.811	3.947	3.837	3.596	3.921	3.963	3.879	3.785
	Std. Deviation		1.148	1.146	1.072	1.023	1.003	1.142	1.114	1.114	1.032	1.046	1.183
	Variance		1.320	1.315	1.149	1.048	1.008	1.305	1.242	1.241	1.067	1.096	1.401
From 11	N	Valid	159	159	159	159	159	159	159	159	159	159	159

years to 15 years	Mean	4.000	3.805	3.974	3.899	3.924	4.257	3.547	3.899	3.981	3.893	3.673
	Std. Deviation	.9743	1.003	.8855	1.038	1.022	.8360	1.266	1.097	1.040	1.100	1.198
	Variance	.949	1.006	.784	1.078	1.045	.699	1.604	1.205	1.082	1.210	1.437
From 16 years to 20 years	N Valid	54	54	54	54	54	54	54	54	54	54	54
	Mean	4.111	4.018	4.166	3.703	4.000	4.074	3.833	3.907	3.888	3.722	3.500
	Std. Deviation	.8165	.9613	.7950	.9640	.8902	.7734	.9466	.8958	1.075	1.122	1.111
	Variance	.667	.924	.632	.929	.792	.598	.896	.803	1.157	1.261	1.236
From 21 years to 25 years	N Valid	18	18	18	18	18	18	18	18	18	18	18
	Mean	4.111	4.055	4.166	3.944	3.944	3.888	3.833	3.777	4.000	3.333	3.722
	Std. Deviation	.8323	.9983	.8574	1.109	1.055	1.078	1.150	1.165	1.137	1.188	1.319
	Variance	.693	.997	.735	1.232	1.114	1.163	1.324	1.359	1.294	1.412	1.742

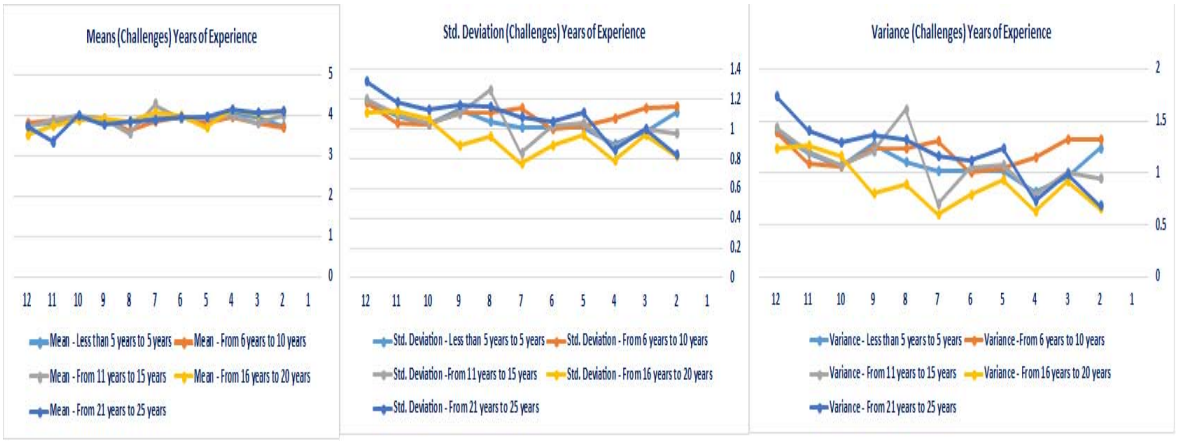

Figure 15. Shows mean scores and standard deviations related to number of years of experience and its relation with problem hindering faculty members from using electronic information resources centers.

Results from statistical analysis to data related to problems hindering faculty members from using information resources centers and its relation with number of years of experience indicated significant differences at **($\alpha \leq$ 0.05),** explained as follows. The mean score of participants of years of 5 years experience was (3.877) with standard deviation of (1.058) and a degree of variance at (1.117). The mean scores of participants of number of years of experience from 6-10 years was (3.834) with standard deviation of (1.071) and a degree of variance of (1.215). The mean scores of participants of number of years experience from 11-15 years was (3.895) with standard deviation of (1.038) and a degree of variance a (1.078). Mean scores of participants of number of years of experience from 16-20 was (3.902) with standard deviation of (0.985) and a degree of variance at (0.803) Mean scores of participants of number of years of experience from 21-25 was (3.888) with standard deviation of (1.068) and a degree of variance at (1.113).

The problems hindering faculty members from using electronic information resources centers in terms of investigation of participants' views are as follows: 'lack of encouragement of faculty members to use electronic information resources'; followed by' lack of electronic information resources centers serving the university'; then, 'lack of specialized trainers to train faculty members in using electronic information resources centers'; after that, lack of an electronic learning environment equipped with technology and modern programs inside the university'; then, ' lack of appropriate places for electronic information resources centers and finally, ' lack of technical support to solve problems facing faculty members when searching electronic information resources centers.

Second: Discussion of Results

First hypotheses

Results related to this hypothesis show different effects to using electronic information resources centers for males and females since there are significant differences in favor of females in terms of importance of acquiring competencies needed to use electronic information resources centers, particularly these related to identifying a strategy for searching electronic databases, methods of documentation of data obtained on line, methods of identifying appropriate databases for particular area of specialization and use of specialized searching engines. These results are supported by the study of **Jain et al. (2012)**, that indicated effective employment of electronic information resources centers in providing the educational content at a wide range and identifying strategies to easily reach required information.

Results indicted differences between males and females in recognizing the nature of needs of faculty members. This is proved by the degree of variance in views of males that were higher than females. Results raise the importance of dealing with individual differences among students and meeting their needs in relation to study courses, allowing opportunities to self-learning, continuous support to teaching and learning, discovering the real aptitudes and potentials of learners, developing learners' abilities in reaching information from multi-resources and enriching learning process.

The study of **Gordillo et al. (2013)** supported the idea of identifying research skills, discovery skills, problem solving skills and learning from multi-resources electronic information. In addition to enabling faculty members to establish new educational units that facilitate learning through electronic information resources.

A number of studies revealed that there are many problems hindering the use of electronic information resources centers in the third world **(King & Boyatt 2015)**. These match results from the current study as shown in the statistical analysis of data that revealed significant differences between males and females in the degree of variance of males in comparison to males... These results may go back to the lack of electronic information resources centers in some Saudi universities, lack of skills of using them, lack of specialized trainers and lack of encouragement. Participants suggested the importance of identifying an institutional strategy aims at providing resources and methods of effective use. Also it was suggested that relying on views of faculty members and making the utmost use of free Google applications for the success of research and teaching processes in terms of cost, easy management and achieving academic goals **(Davidson et al. 2013)**.

Second hypotheses

There are significant differences among different academic ranks arranged as follows: lecturers, assistant professor, associate professor and professor. This is explained in terms of: the desire for identifying required electronic databases according to the academic area of specialization, documentation of references obtained on line, evaluation of search results, ability to use technical support and on line guide of topics and the possibility of using electronic information resources. That is assured by the study of **Davids et al. 2015** and **Basha et al. 2013.** The current study indicated the importance of helping lecturers and assistant professors in acquiring competencies of using electronic information resources centers as they are considered the most active members in the field of teaching and research.

Results indicated the needs of faculty members according to the academic rank as follows: associate professor- demonstrator- lecturer- assistant professor- professor. The degree of variance for assistant professors and professors were less than other academic ranks. The study of **Amjad et al. (2013)**. indicated that most researchers are in need of using electronic information resources centers for the purposes of teaching, researching, using and learning at the appropriate times and discovery of real aptitudes and potentials of learners. Views were variant regarding processes of preparation and implementation of lectures in addition to developing abilities of students in reaching information from multi-sources.

Results indicated significant differences among different academic ranks arranged as follows: associate professor- demonstrator- professor- assistant professor- lecturer. Variance in views shown in different responses of participants in terms of problems hindering them from using electronic information resources centers, lack of encouragements towards using these centers, lack of enough places for these centers, lack of technical support to help faculty members solving their problems and lack of skills of using these centers.

Third hypotheses

Area of academic specialization plays a great role in orienting the hypotheses regarding helping Saudi faculty members acquiring competencies of using electronic information resources centers. Results indicated significant differences at **($\alpha \leq 0.05$)**, level in favor of applied sciences specializations, followed by health sciences and finally humanities. Results from the current study agrees with results from the study of **Fahad et al. (2013)**. This

indicated the need for identifying appropriate strategies for researching electronic databases, identifying particular methods for academic areas of specialization, searching methods and documentation of references obtained on line **(Feraru & Teodorescu 2009)**.

Responses of questionnaire items related to needs of faculty members in using electronic information resources centers indicated the importance of developing research, thinking and problem solving skills to their students through teaching. Also the importance of providing them with skills enabling them to adapt and make use of competitive rapid developments in the field of information systems. These results agree with results from the study of **Henle (2008)**. As it showed significant differences at **($\alpha \leq 0.05$),** level in favor of health sciences, followed by applied sciences and finally humanities. The current study is supported by the results from the study of **Solomou et al. (2015)** that indicated the importance of dealing with individual differences, fulfilling students' needs, discovery of real aptitudes and potentials of students, using and learning at the appropriate times were the most prominent results obtained. Also, the study of **Dalveren (2014)** goes in match with the current study in relation to needs of using electronic information resources centers.

The analysis of data related to problems hindering different academic areas of specialization from using electronic information resources centers indicated significant differences at **($\alpha \leq 0.05$),** level in favor of health sciences, followed by humanities and finally applied sciences. The study of **Gordillo et al. (2013)** found out that electronic information resources centers play a vital role in the future of education, providing learning content at a wide range, overcoming problems hindering the use of these centers. Results from this study match the results of the current study as it indicated the lack of these centers, lack of skills of using them and lack of such centers to help particular areas of academic specializations came on top of all problems hindering faculty members using electronic information resources centers. In addition to lack of flexibility in using these centers in comparison to applied specializations and the inability to use them in terms of easy access. **(Taber and García-Franco 2010).**

Fourth hypotheses

Results from the current study revealed significance differences at **($\alpha \leq 0.05$),** level among different number of years of experience in relation to the need of acquiring competencies of using electronic information resources centers. Number of years of experience from 21-25 came on top followed by 16-20, then 6-11, after that 10-15 and finally from 1-5. The most prominent reported competency was the ability of faculty members to use direct technical support, use of guide of topics on line and identifying strategies for searching electronic databases **(Caird & Lane 2015)**. The current study also agrees with a British study to develop models for helping faculty members to acquire competencies and skills. This study resulted in identifying components of the main page of electronic database, entering electronic database using abbreviated names, recognizing different types of electronic databases and methods of arranging variables of searching electronic databases **(Yang et al. 2014)**. Results from the current study revealed variance in views in terms of number of years of experience from 1-5, then 6-11, then 10 to 15. Results indicted significant differences at **($\alpha \leq 0.05$),** level among different years of experience in terms of needs of faculty members in using electronic information resources centers as follows: from 20-25, followed by 11-15, then 6-10, then 16 to 20 and finally from 1-5. The need of using these centers, developing students ability to obtain information from multi-sources, discovering real aptitudes and potentials and allowing opportunities for self-learning were the most prominent and match with the study of **Casquero et al. (2015)**. This study aimed assessing needs of students for on line use of electronic information resources centers and its relationship with establishing persona information networks, using and learning at the appropriate times, helping in preparation and implementation of lecture, classifying and organizing electronic information to facilitate access to them.

Examining data related to the variable of number of years of experience in relation to problems hindering faculty members from using electronic information resources centers revealed significant differences at **($\alpha \leq 0.05$),** level details are as follows: from 16-20 were on top followed by 11-15, then 21-25, variance in views were for years of experience, 6-10 and 20-25 and 1-5.

Results from the current study revealed that lack of encouraging faculty members of using electronic information centers agree with the study of **Peacock et al. (2013)**, as this study identified problems and obstacles related to developing thinking skills. The current study indicated that lack of specialized trainers to train faculty members in using electronic information resources centers was the most prominent obstacle, in addition to lack of an electronic educational environment equipped with technology and modern programs inside colleges of the university. Also, lack of these centers inside universities, lack of appropriate places inside the university and lack of technical support to solve problems of searching electronic databases **(King & Boyatt 2015)**.

CONCLUSION

This study addressed the issue of using electronic information resources centers by the faculty members in the Saudi universities. In this context, the study investigated the challenges faculty members face in relation to the use of these information centers. It also outlines the needs of faculty members to get the optimal use of these results. The study was based on a questionnaire design where male and female faculty members in a number of Saudi universities voluntarily responded to the questionnaire. Findings can be summarized as follows.

- Expanding the establishment of electronic information resources centers in new universities.
- Designing training courses to staff members in acquiring needed competencies and fulfilling their needs.
- Designing a plan for solving problems hindering faculty members from using electronic information resources centers.
- Examining the factual situation of using electronic information resources centers in Saudi universities
- Designing strategies for using electronic information resources centers.
- Designing training courses to prepare specialists to offer technical support to faculty members.
- Designing training courses to university students in using electronic information centers and ways of making use of them.

Finally it is recommended that universities need to make electronic information resources available to the faculty members. Universities are also encouraged to conduct training workshops for faculty members for the effective use of these centers.

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