TOJET
The Turkish Online Journal of Educational Technology

ISSN 2146-7242

Turkish Online Journal of Educational Technology

Volume 14, Issue 2
April 2015

TOJET
01.04.2015

THE TURKISH ONLINE JOURNAL OF EDUCATIONAL TECHNOLOGY

April 2015
Volume 14 - Issue 2

ISSN: 2146 - 7242

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

Published in TURKEY

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

Message from the Editor-in-Chief

Dear Colleagues,

TOJET welcomes you. TOJET would like to thank you for your online journal interest. The online journal system has been diffused very fast for last ten years. We are delighted that almost 500,000 educators, teachers, parents, and students from around the world have visited for the fourteen years. It means that TOJET has continued to diffuse new trends in educational technology to all over the world since October, 2002. We hope that the volume 14, issue 2 will also successfully accomplish our global educational technology goal.

TOJET is confident that readers will learn and get different aspects on how to use educational technology in learning and teaching environments. Any views expressed in this publication are the views of the authors and are not the views of the Editor and TOJET.

TOJET thanks and appreciate the editorial board who has acted as reviewers for one or more submissions of this issue for their valuable contributions.

TOJET organized IETC-2014 conference in Chicago, USA last year. All IETC-2014 English papers have been published in volume-176 Procedia – Social and Behavioral Sciences. You can rich Procedia – Social and Behavioral Sciences from the below link: http://www.sciencedirect.com/science/journal/18770428

TOJET, AECT-Association for Educational Communication and Technology, Sakarya University, İstanbul University and Governor State University will organize IETC-2015- Fifteenth International Educational Technology Conference (www.iet-c.net) between May 27-29, 2015 at Istanbul University, Istanbul, Turkey. This conference is now a well-known educational technology event. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities. Its focus is to create and disseminate knowledge about the use of instructional technology for learning and teaching in education. IETC-2014 conference book has been published at **http://www.iet-c.net/pubs**

Call for Papers
TOJET invites you article contributions. Submitted articles should be about all aspects of educational technology. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET. Manuscripts must be submitted in English.

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

April 01, 2015
Prof. Dr. Aytekin ISMAN
Sakarya University

Editorial Board

Table of Contents

A Defining Moment in E-Working: The Application of an E-Working Definition to the Education Context

Hazel BEADLE
Senior Lecturer in Leadership and Management, Chichester Institute of Education, University of Chichester. United Kingdom
h.beadle@chi.ac.uk

ABSTRACT
Using qualitative data gathered through 144 questionnaires completed online by education sector personnel, this paper examines the relevance of a definition of e-working to the educational context. It identifies that the definition, which draws on and extends existing knowledge and identifies e-working to be a way of being a worker as well as a way or a mechanism for carrying out the work task, has clear potential to be applied within the education sector. The paper identifies that it is not the composite elements of the definition which may appear alien to the worker in the educational context, but instead inference drawn from the way in which the e-working term has hitherto been regarded.

INTRODUCTION
In recent years there has been an increase in the number of people who see themselves, or whom are seen, to be working flexibly as a consequence of the presence of technology. Furthermore, the nature of flexible working has changed alongside developments in that technology. This mechanism for working need not necessitate being away from the work place any more than being away from the workplace is any longer inherently linked with not working; typically 'the day off'/annual leave or sickness absence.

Whilst educational institutions are seen to make active use of technology, there is suggestion that they, and in particular schools, have been less open to technology-supported flexible working arrangements. Underpinning this suggestion is an argument that a physical presence is essential to effective role performance and, regardless of the nature of the work and whether there are alternative ways for it to be carried out, traditional ways of working have been favoured.

This paper takes a theoretical stance by examining the relevance of the author's definition of e-working, derived as part of the author's PhD research, and a definition which both draws on and extends existing knowledge about the concept, to the educational context. The definition purports that e-working amounts, in the presence of technology, to a way of being a worker as well as a way of carrying out the work task. In furthering the theoretical understanding, the examination makes active use of survey data contributed by educational professional (largely school-based) users of technology recruited through the social media site Twitter.

LITERATURE REVIEW
Terminological vagueness
The technology term is used within the literature with a measure of constancy, for example in the need for some form of ‘hardware’ and the association of this hardware with ‘software’ (e.g. Binken and Stremersch, 2009; Breedon et al, 2012; Hogman and Johannesson, 2013; Vangelski, 2013; Thorat et al, 2013; Lin et al, 2014). The literature also places significant emphasis on technology’s potential to develop and change (Orlikowski, 1988; Earl, 1989; Monk, 1989; Knights and Murray, 1994; Alter, 1996; Teich et al, 1999; McLoughlin et al, 2001; Panayotopoulou et al, 2010; Vartiainen and Hyrkkänen, 2010; Scholarios and Taylor, 2010). There is suggestion that technological development and change is directly influenced by situational factors (Woolgar et al, 1998; Kling, 2003) and there is little to suggest that the nature and the environment of the educational context have any less influence than that seen in other sectors.

However, this potential to develop and change is seen to have resulted in innumerable hybrid formations combining both new and old technological practices (Kling and Crawford, 1999; Pinnington and Morris, 2003; Ritchie and Brindley, 2005; Faulconbridge and Muzio, 2008). Furthermore, this combination of the old and the new has contributed to there being a perceived lack of clarity. This lack of clarity is acknowledged by a number of writers (e.g. Sullivan, 2003; Clarke and Preece, 2005); a perspective potentially reflective of Knights and Murray’s (1994 p.21) ‘genesis and crystallisation of new technologies’ debate and remaining a feature even in more recent academic material (e.g. Vayre and Pignault, 2014).

Technological change has caused uncertainty and there is literature which acknowledges the fears surrounding such change (e.g. Kling and Crawford, 1999; Kling, 2003; Johnston and Waretin, 2010 and Meier et al, 2013).

For this reason a link between the use of technology and an argument of innovation appears present, at least within the education sector. There is significant emphasis placed, for example, on classroom use of Twitter being innovative (Manzo, 2009; Manchir, 2012; Stuchbery, 2013) and on teachers needing to integrate technology into their own practice, in part as an exemplar of how technology might be embraced (Demski, 2012; Larkin, 2013).

Such has been the pace of technological change more generally that it appears to not have proved possible to robustly 'map out' terminology. Indeed, Earl (1989 p.21) suggests texts have actively avoided providing technology-associated definitions seemingly on the pretext of, using a phrase highlighted by Woolgar and Cooper (1999), 'the risk of instituting artificially rigid distinctions'. If this is true, and furthermore if it is a consequence of failing to encapsulate the full breadth of technology's potential on the grounds of that technology being an ever moving feast, then perhaps it should not be surprising that there should also be some lack of terminological clarity surrounding the association of workers with that technology. After all, this 'social' element is regarded to have added a new dimension (Woolgar and Grint, 1991; Grint and Woolgar, 1992, 1995; Woolgar, 1981, 1991, 1993; Kling, 1992; Kling and Crawford, 1999; Ekbia and Kling, 2005).

Woolgar et al (2009 p.6) identify that a lack of technology associated clarity results in work being based on assumptions. It is a dimension which is acknowledged to be of significance. McKemmish et al (2012 p.985) write, for example,

> From a research perspective, enhancing our understanding of interactions between people, the contexts in which they are situated, technologies, systems and information, is seen as one of the keys to developing better information technologies, management and systems.

E-working is a term readily used in practice but receiving limited explanation within the literature, even when actively used (e.g. Chang et al, 2003; Wang et al, 2012). It is thus a term which appears to be based on the aforementioned presence of 'assumption' (Woolgar et al, 2009).

Whilst this limited mention presents difficulties for assigning a clear definition to the term, to avoid doing so risks perpetuation of what Barley (1990 p.64) terms 'a maze of analytic abstractions' and arguably fuels the argument, at least within the education sector, that e-working is a contextual irrelevance. Indeed the muddiness of the e-working understanding is compounded by an ever growing array of perspectives, the consequence of what Earl (1989) highlights as 'multiple-frameworks'. And whilst some writers (e.g. Jaakson and Kallaste, 2010; Pollitt, 2010) highlight that definition assignment has the potential to result in too narrow a descriptor, there is a strong argument presented (e.g. Agarwal and Prasad, 1998; Bassellier et al, 2001; Leonardi et al, 2013; Hyde, 2014) that the presence of these technology-related descriptors provide value through an understanding which is benchmarked to the contemporary environment.

Thus with such vagueness surrounding the e-working term identified to be generally present, it is not surprising that in an environment such as the school context, where other elements of change are at times perceived as offering an onslaught to operational practice, that clarification and embracement of the e-working term may not have been perceived as a priority. Yet attempts have been made to define e-working related terminology more broadly and it is to these which attention now turns.

Terminological usage

Amongst the attempts to provide an e-working related definition falls the work of Tijdens and Steijn (2002) who differentiate between the impact of embedded and programmable technology and Haddon and Brynin (2005) who provide definitions of assorted terms such as 'NetHomeworkers' and 'PCHomeworkers'. Earlier writing, such as that of Blauner (1964), shows a tendency towards highlighting the 'progressive nature of technology' placing emphasis on technology's mechanistic nature. This mechanistic focus stems back to the 'late 1940s and early 1950s' (Kumar, 2005 pp.33-34) and indicates that over time greater awareness of the user of technology has arisen; akin to technology being a subject for consideration within a social science framework (Woolgar and Grint, 1991; Grint and Woolgar, 1992, 1995; Woolgar, 1981, 1991, 1993).

There are various facets contributing to the clarification of technological terminology. It is seen, for example, that terminology has taken a broadened focus alongside a decrease in technological mystique. Knights and Murray (1994) and Alter (1996) demonstrate a parallel in their perspectives by highlighting that that mystique has played a role in the generation of terminological vagueness. Furthermore, Woolgar and Lezaun (2013) write of this in terms of the conceptualisation process acknowledging the influence of the individual's ontology, an argument that develops Woolgar's earlier writing on the 'perspective' of ideas (Woolgar and Grint, 1996; Woolgar, 2004). Shuen (2008 p.129) suggests that mystique can be used to overcome the discomfort caused by

technological progress ‘disrupting the old order’, a perspective which parallels with Woolgar’s (2004 p.451) observation, that “presenters of ideas should adopt a register appropriate to the presumed expectations of the audience”. Unquestionably the mitigating of discomfort may have proved useful in the contextual environment. However, with an increasing focus on technological use, what McLoughlin et al (2000) argue facilitates an understanding of technology and is suggested by Mcloughlin and Badham (2005) to reflect the increasing popularity of in situ examination, two terms have come to the fore: telework and telecommuting.

Sullivan (2003) suggests that the first of these terms, telework, is remote work using information and communication technologies. In practice the term is used to place emphasis on work being carried out away from the formal workplace, in the case of this study the educational institution, with the literature almost without exception making use of the term ‘home’. There is emphasis on the approach being non-standard (Brocklehurst, 1989; Di Martino and Wirth, 1990; Stanworth and Stanworth, 1991); with the ‘home’ link continuing into more recent literature (Golden, 2012; Bayrak, 2012; Vink et al, 2012; Maruyama and Tietze, 2012; Neirotti et al, 2013; Hilbrecht et al, 2013; Gold and Mustafa, 2013; Sayah, 2013).

The second term, 'telecommuting’, is suggested to have emanated from the association with avoiding physical travel to the workplace (Sullivan, 2003) and in particular mitigating the effect of the 1970s oil crises (Mann and Holdsworth, 2003). Jack Nilles from the Centre for Futures Research in California is credited with making first use of the terminology in the mid 1970s (Bailey and Kurland, 2002; Mann and Holdsworth, 2003). However like telework, the telecommuting term retains ‘home’ connotations (Ahuja, 2002; McLarty, 2004; Kirk and Belovics, 2006; Mayo et al, 2009; Vesilind, 2010; Fonner and Stache, 2012; Heng et al, 2012; Wheatley, 2012; Clark et al, 2012; Berinato, 2014); the base point from which travel commences.

There is, however, a smaller body of recent technology related literature (e.g. Ellison, 2012; Bentley, 2014) which identifies the existence of a ‘work anywhere’ or ‘most suitable location’ approach, despite some caution in use of the term being evident. Hortensia (2008 p.269), for example, uses the ‘virtual workplace’ term but explains this in terms of being ‘from home or other locations outside the organisation’. Hislop and Axtell (2007 p. 34) acknowledge ‘spatial mobility’, highlighting that it is ‘commonplace to see work being undertaken whilst travelling on trains, at motorway service stations, or in the departure lounges of airports’. They make mention of ‘nomadic’ terminology, but there is limited embracement of the potential to vary between different types of locations or, particularly, the potential to combine this with work at a central (organisationally provided) location such as on the school site.

In parallel to the flexible work location is the flexibility surrounding the work role. Telecommuting is still seen to have echoes of its initial ‘telephone-task’ basis, with the limitations of traditional telephony making the term increasingly redundant. Nof (2003) appears to acknowledge this redundancy and is regularly cited as explaining e-working as embracing 'computer-supported' technologies. The Nof (2003) phraseology demonstrates a broadened focus and yet even this appears to emphasise a predominant focus on the technological tool as opposed to any user of that tool.

This noted, more recently used terminology identifies the 'people presence' as having an increasingly significant influence. Historically the literature shows a tendency towards favouring a handling of the people presence under a ‘social informatics’ heading (Kling, 1977; Kraemer et al, 1979; Hiltz et al, 1981; Kling, 1991). This element is of note, but demonstrates some limitations with regard to the breadth of the people management practices which e-working embraces. Some acknowledgement of this is identified in the tendency towards a simple prefixing of ‘e-‘ alongside supervisory expectations as seen, for example, in the e-management (Hashim et al, 2010; Yao et al, 2011) and e-leadership (Jameson, 2013; Chang and Lee, 2013; Avolio et al, 2014) terms. In each case there is indication of the ‘electronic’ basis but less specification of the mechanism. In effect there is acknowledgement of a relationship between people and the technology which is made available to them, with the location at which the work is undertaken appearing less predominant.

Clarification of the e-working term

With so many facets to e-working, and many of those facets subject to development potential, it is not surprising that the full expanse of the e-working term has failed to be fully acknowledged. This may explain, although not excuse, the absence of specific application to the educational sector. Regardless of environment, this lack of clarity has implications at both conceptual and practical levels.

Drawing the aforementioned points together, it is reasoned that e-working is a mechanism for executing work-related tasks utilising technology in the form of electronic media. Since these tasks are so broad ranging, what the ‘work tasks’ associated with e-working amount to is largely immaterial. Technological media is subject to

development. This developmental factor, seen in the literature as having the potential to impede provision of an e-working definition, is central to the reality of working with technology. Embracement of development contributes to terminological longevity. It also heightens awareness of new or innovative practice; including ways of culturing and sustaining the relationship between the worker and the technology made available to them. Thus, in brief, *e-working is a way of being a worker as well as a way or a mechanism for carrying out the work task.*

METHODOLOGY

In examining the relevance of the e-working definition to education sector personnel, use was made of qualitative data gathered from education professional users of the social media site Twitter. These professionals had been asked to reflect on their use of Twitter in a professional capacity, for example to satisfy continuing professional development (CPD) needs. Twitter postings directed participants to an online questionnaire, thus establishing a measure of competence in the use of technology. Limiting the analysis to those who demonstrated some ability to use technology was not regarded to compromise the study since the purpose was to establish the relevance of the e-working definition to the educational context - as opposed, for example, to the extent to which individuals perceived themselves to be e-workers.

In total 144 questionnaires were analysed. 70% of the questionnaires were completed by female participants, 28% by male participants and 2% by those who declined to identify their gender. In each of the two main categories the age span ranged from the 20s to the 60s, with 43% of participants falling into the 40-49 age bracket. Criteria for selection of the questionnaire from the total volume returned was simply that the participant identified themselves to usually be employed in the education sector. This allowed, for example, the inclusion of 'freelance' or 'supply' teachers who are reasoned to play a role in the life of many schools but bring with them perspectives potentially unencumbered by a single teaching base.

FINDINGS

The way of being the worker

The data indicated an awareness that technological media is subject to development. A male secondary teacher described this, for example, as enabling him to 'be at the cutting edge of new or innovative practise', whilst a female Assistant Secondary Head identified that as a consequence of developing skills in handling technological change this had encouraged her both to support and embrace in-school change. Underpinning a number of the comments was indication that engagement with technology flagged up the need for other changes in working practice. However bridging a link between being a user of technology and other roles was not seen as always being straight-forward. A male Subject Director highlighted, for example, the need to be 'very disciplined and prepared to find ways of filtering out the noise'. Relating to this noise theme, was mention of technology having the potential to exacerbate some of the uncertainties surrounding current roles. Whilst this did not always appear unwelcomed, associated anxieties were highlighted.

The presence of technology was suggested to offer an additional mechanism for communication. A primary teacher identified she had tried to use technology to supplement face-to-face communication but that some of her efforts had been thwarted by the attitude of her school colleagues. She emphasised that whilst communication using technology lacked some of 'the niceities associated with face-to-face discussions' it facilitated 'information being distributed and made for a more effective way of working'. However the data also revealed others suggesting that their experience of technology was that it resulted in a compromising of effective management communications and led, in the words of a female Teacher of History, to 'managers hiding behind their computer'.

The data also evidenced there to be an awareness of the consequences of engaging with technology. A female Year Leader, for example, highlighted that 'using technology beyond the bare minimum shows that it interests you'. This demonstration was regarded to be important. "Educators are grounded and encouraged by sharing practice and views. We energise each other through sharing. If the technology doesn't facilitate that sharing then it risks compromising the spirit of education" (Head of Geography).

The way of carrying out the work task

There was some identification that technology has the potential to impact upon the creativity attached to the role of the professional educator. As a male Subject Head identified, "it can be constraining. You do things in a certain way because that is how [technology] drives you to act". Likewise, a female Secondary Teacher suggested that the technology did not always lead her to actions which she felt 'epitomised good practice or ideas'. This noted, not all the responses indicated the presence of an innate acceptance of limitations. A male Science Teacher, for example, recounted being shown how to use the technology which his school had

purchased and how he had then set about identifying more effective ways of working with that technology. The ability to "adjust working practice to fit with the learning expectations of a teaching role" (Assistant Primary Head) was likewise indicated.

Also identified amongst the responses was some awareness that the use of technology requires skills which may be different to other elements of the teaching role and that changes in working practice may well be a consequence of the increasing use of technology. There was, for example, regular use of phrases such as 'the knock on effect'. Likewise there was regular mention of concise working practices. The indication was that technology offered time saving potential and that time could, in the words of one female Primary Teacher, "be reinvested into other elements of the teaching role". However it was also acknowledged that the likelihood of time being freed up could result in a tendency towards 'work being done at the last minute' (Male Secondary Teacher).

The potential to use technology in order to gain credibility with 'digital native' students and, in the words of a Secondary Assistant Head, "bridge the gap between the classroom and the world outside school" was highlighted. The ability to evidence industry competence was also raised. Furthermore, being seen to use technology was also suggested to 'have the potential to support colleagues' (Female Primary Teacher) in that it provided a role model.

Some individuals highlighted being on the receiving end of covert pressure to engage with technology. However a frequent sentiment expressed was that once initial resistance had been overcome, the potential for technology-related solutions was actively sought. One Headteacher, for example, highlighted he "increasingly used technology to support other elements of [his] role e.g. Google apps, calendar, email and shared documents".

DISCUSSION AND CONCLUSION

The data highlights there to be a relationship between the way of being a worker and the way or mechanism for carrying out the work task amongst the participants drawn from the educational sector. Since a link between role and mechanism has been embraced in technology related studies involving students (e.g. Acikalin, 2010; Arslan, 2013; Liu and Lee, 2013), this relationship should, perhaps, not be a surprise. By extrapolation there is also acknowledgement that use of technology involves consideration of the worker as an individual; identified in the literature in terms of being a 'social' element. Again, with regard to educators facilitating student development, this has also been acknowledged (Aksal, 2009; Ilin, 2013). The question which arises is why principles used in teaching practice have not been so openly acknowledged in relation to the educational professional's role?

The data highlights that in the experience of the technology using participants drawn from the education sector, the way of being the worker embraces the developmental influence of technology as well as the implications of technology's presence. These implications include the impression cultured by the use of technology as well as the influence on the worker's practices. The way of carrying out the work task has a relationship with the creativity deployed by the professional educator; professionals within the sector being acknowledged to have strong capabilities with regard to technological integration (Baran et al, 2011; Isman, 2012). Furthermore, whilst skills deployed in using technology have the potential to differ from those which may be used in other elements of an educator's role, these need not be stand alone but, instead, have the potential to enhance other role-related capabilities. Other studies have similarly identified the adaptability required by technological usage being linked with employment sector retention (Omar and Nordin, 2013).

Thus in examining the relevance of the definition of e-working which provides that *e-working is a way of being a worker as well as a way or a mechanism for carrying out the work task,* it is seen that the definition has clear potential to be applied within the education sector. Indeed it would appear that it is not the composite elements of the definition which may appear alien to the worker in the educational context but instead inference drawn from the way in which the e-working term has hitherto been regarded. As elsewhere, the absence of a clear definition for the term may well have resulted in presupposition that e-working is largely an irrelevance; the manifestation of Barley's (1990) 'analytic abstraction' where credibility has been forfeited as a consequence of the favouring of traditional mechanisms. The effect is an extension of the presence of ‘assumption’ (Woolgar et al, 2009) which, risking disruption of the old order (Shuen, 2008), might well have been cultivated - either purposefully or through default.

REFERENCES

Acikalin, M. (2010). Exemplary social studies teachers use of computer-supported instruction in the classroom. *Turkish Online Journal of Educational Technology*, 9(4), 66-82.

Agarwal, R. and Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, 9(2), 204-215.

Ahuja, S. (2002). Distributed teams in e-work organisations: The new issues. *Journal of Services Research*, 2(2), 79-95.

Aksal, F. (2009). Action plan on communication practices: Roles of tutors at EMU Distance Education Institute to overcome social barriers in constructing knowledge. *Turkish Online Journal of Educational Technology*, 8(2), 33-47.

Alter, S. (1996). *Information systems: A Management Perspective* (2nd ed.). Wokingham: Benjamin Cummings.

Arslan, R. (2013). Integrating feedback into prospective English Language Teachers' writing process via blogs and portfolios. *Turkish Online Journal of Educational Technology*, 13(1), 131-150.

Avolio, B., Sosik, J., Kahai, S. and Baker, B. (2014). E-leadership: Re-examining transformations in leadership source and transmission. *Leadership Quarterly*, 25(1), 105-131.

Bailey, D. and Kurland, N. (2002). A Review of Telework Research: Findings, New Directions, and Lessons for the Study of Modern Work. *Journal of Organizational Behavior*, 23(4), 383–400.

Baran, E., Chuang, H. and Thompson, A. (2011). TPACK: An emerging research and development tool for teacher educators. *Turkish Online Journal of Educational Technology*, 10(4), 370-377.

Barley, S. (1990). The Alignment of Technology and Structure through Roles and Networks. *Administrative Science Quarterly*, 35(1), 61-103.

Bassellier, G., Reich, B. and Benbasat, I. (2001). Information technology competence of business managers: A definition and research model. *Journal of Management Information Systems*, 17(4), 159-182.

Bayrak, T. (2012). IT support services for telecommuting workforce. *Telematics and Informatics*, 29(3), 286-293.

Bentley, T. (2014). How can organisations realise the positive benefits of 'anywhere working'? *Human Resources Magazine*, 18(6), 8-11.

Berinato, S. (2014). To raise productivity, let more employees work from home. *Harvard Business Review*, 92(1/2), 28-29.

Binken, J. and Stremersch, S. (2009). The effect of superstar software on hardware sales in system markets. *Journal of Marketing*, 73(2), 88-104.

Blauner, R. (1964). *Alienation and Freedom.* London: University of Chicago.

Breedon, P., Arthur, L. and Coulter, F. (2012). An open source hardware and software platform for interdisciplinary design: Electronics, interfacing and programming for the designer. *International Journal of Technology, Knowledge and Society*, 8(2), 143-149.

Brocklehurst, M. (1989). Homeworking and the New Technology: The reality and the Rhetoric. *Personnel Review*, 18(2), 1-70.

Chang, T., Shin, K. and Park, K. (2003). A development methodology for e-work ontology using RDF/RDFS and PSL. *Production Planning and Control*, 14(8), 766-777.

Chang, W. and Lee, C. (2013). Virtual team e-leadership: The effects of leadership style and conflict management mode on the online learning performance of students in a business-planning course. *British Journal of Educational Technology*, 44(6), 986-999.

Clark, L., Karau, S. and Michalisin, M. (2012). Telecommuting attitudes and the 'big five' personality dimensions. *Journal of Management Policy and Practice*, 13(3), 31-46.

Clarke, K. and Preece, D. (2005). Constructing and using a company Intranet: 'it's a very cultural thing'. *New Technology, Work and Employment*, 20(2), 150-165.

Demski, J. (2012). The seven habits. *T H E Journal*, 39(5), 48-55.

Di Martino, V. and Wirth, L. (1990). Telework: A new way of working and living. *International Labour Review*, 129(5), 529-544.

Earl, M. (1989). *Management strategies for information technology*. Hemel Hempstead: Prentice Hall.

Ekbia, H. and Kling, R. (2005). Network organizations: Symmetric cooperation or multivalent negotiation? *Information Society*, 21(3), 155-168.

Ellison, J. (2012). Ergonomics for telecommuters: and other remote workers. *Professional Safety*, 57(6), 86-90.

Faulconbridge, J. and Muzio, D. (2008). Organizational professionalism in globalizing law firms. *Work, Employment and Society*, 22(1), 7-25.

Fonner, K. and Stache, L. (2012). All in a day's work, at home: teleworkers' management of micro role transitions and the work-home boundary. *New Technology, Work and Employment*, 27(3), 242-257.

Gold, M. and Mustafa, M. (2013). 'Work always wins': client colonisation, time management and the anxieties of connected freelancers. *New Technology, Work and Employment*, 28(3), 197-211.

Golden, T. (2012). Altering the effects of work and family conflict on exhaustion: Telework during traditional and non-traditional work hours. *Journal of Business and Psychology,* 27(3), 255-269.
Grint, K. and Woolgar, S. (1992). Computers, guns and roses: What's social about being shot? *Science, Technology and Human Values,* 17(3), 366-380.
Grint, K. and Woolgar, S. (1995). On some failures of nerve in constructivist and feminist analyses of technology. *Technology and Human Values,* 20(3), 286-310.
Haddon, L. and Brynin, M. (2005). The character of telework and the characteristics of teleworkers. *New Technology, Work and Employment,* 20(1), 34-46.
Hashim, F., Alam, G. and Siraj, S. (2010). Information and communication technology for participatory based decision making e-management for administrative efficiency in higher education. *International Journal of the Physical Sciences,* 5(4), 383-392.
Heng, T., San, O. and Lee, L. (2012). The acceptance and effectiveness of telecommuting (work from home) in Malaysia. *Asia Pacific Journal of Research in Business Management,* 3(3), 1.
Hilbrecht, M., Shaw, S., Johnson, L. and Andrey, J. (2013). Remixing work, family and leisure: teleworkers' experiences of everyday life. *New Technology, Work and Employment,* 28(2), 130-144.
Hiltz, S., Turoff, M. and Kling, R. (1981). Evolution of user behaviour in a computerized conferencing system. *Communications of the ACM,* 24(11), 739-751.
Hislop, D. and Axtell, C. (2007). The neglect of spatial mobility in contemporary studies of work: The case of telework. *New Technology, Work and Employment,* 22(1), 34-51.
Hogman, U. and Johannesson, H. (2013). Applying stage-gate processes to technology development - Experience from six hardware orientated companies. *Journal of Engineering and Technology Management,* 30(3), 264-287.
Hortensia, G. (2008). Virtual workplace and telecommuting: Challenges that redefine the concept of work and workplace. *Annals of the University of Oradea – Economic Science Series,* 17(4), 269-274.
Hyde, R. (2014). The technology and attitudinal fix. Redefining the definition of high performance building. *Architectural Science Review,* 57(3), 155-158.
Ilin, G. (2013). Moodle: A way for blending VLE and face-to-face instruction in the ELT context? *Turkish Online Journal of Educational Technology,* 12(4), 103-112.
Isman, A. (2012). Technology and Technique: An Educational Perspective. *Turkish Online Journal of Educational Technology,* 11(2), 207-213.
Jaakson, K. and Kallaste, E. (2010). Beyond flexibility: reallocation of responsibilities in the case of telework. *New Technology, Work and Employment,* 25(3), 196–209.
Jameson, J. (2013). e-Leadership in higher education: The fifth "age" of educational technology research. *British Journal of Educational Technology,* 44(6), 889-915.
Johnston, A. and Warentin, M. (2010). Fear appeals and information security behaviours: An empirical study. *MIS Quarterly,* 34(3), 549-566.
Kirk, J. and Belovics, R. (2006). Making e-working work. *Journal of Employment Counseling,* 43(1), 39-46.
Kling, R. (1977). The organizational context of user-centered software designs. *MIS Quarterly,* 1(4), 41-52.
Kling, R. (1991). Computerization and social transformations. *Science, Technology and Human Values,* 16(3), 342-367.
Kling, R. (1992). Audiences, narratives and human values in social studies of technology. *Science, Technology and Human Values,* 17(3), 349-365.
Kling, R. (2003). Critical professional education about information and communication technologies and social life. *Information Technology and People,* 16(4), 394-418.
Kling, R. and Crawford, H. (1999). From retrieval to communication: The development, use and consequences of digital documentary systems. *Journal of the American Society for Information Science,* 50(12), 1121-1122.
Knights, D. and Murray, F. (1994). *Managers Divided: Organisation Politics and Information Technology Management*. Chichester: Wiley.
Kraemer, K., Colton, K. and Kling, R. (1979). Policy, values and EFT Research: Anatomy of a Research Agenda. *Communications of the ACM,* 22(12), 660-671.
Kumar, K. (2005). *From Post-Industrial to Post-Modern Society.* Oxford: Blackwell.
Larkin, P. (2013). Tweeting the good news and other ways to use social media. *Educational Leadership,* 70(7), 70-72.
Leonardi, P., Huysman, M. and Steinfield, C. (2013). Enterprise social media: Definition, history and prospects for the study of social technologies in organizations. *Journal of Computer-Mediated Communication,* 19(1), 1-19.
Lin, S., Zimmer, J. and Lee, V. (2014). Decoupling software from hardware in technology acceptance research. *Journal of Computer Information Systems,* 54(2), 77-86.

Liu, E. and Lee, C. (2013). Using peer feedback to improve learning via online peer assessment. *Turkish Online Journal of Educational Technology*, 12(1), 187-199.
Manchir, M. (2012). Twitter evolves as a tool for little ones to tweet about school activities. *Education Week*, 31(24), 9.
Mann, A. and Holdsworth, L. (2003). The Psychological Impact of Teleworking: Stress, Emotions and Health. *New Technology, Work and Employment*, 18(3), 196–211.
Manzo, K. (2009). Twitter lessons in 140 characters or less. *Education Week*, 29(8), 1.
Maruyama, T. and Tietze, S. (2012). From anxiety to assurance: concerns and outcomes of telework. *Personnel Review*, 41(4), 450-469.
Mayo, M., Pastor, J., Gomez-Mejia, L. and Cruz, C. (2009). Why some firms adopt telecommuting while others do not: A contingency perspective. *Human Resource Management*, 48(6), 917-939.
McKemmish, S., Burstein, F., Faulkhead, S., Fisher, J., Gilliland, A. and McLoughlin, I. (2012). Working with communities: Community partnership research in information technology, management and systems. *Information, Communication and Society*, 15(7), 985-990.
McLarty, S. (2004). Why doesn't everyone telecommute? *Communications of the ACM*, 47(11), 12-13.
McLoughlin, I. and Badham, R. (2005). Political process perspectives on organization and technological change. *Human Relations*, 58(7), 827-843.
McLoughlin, I., Badham, R. and Couchman, P. (2000). Rethinking Political Process in Technological Change: Socio-technical Configurations and Frames. *Technology Analysis and Strategic Management*, 12(1), 17–37.
McLoughlin, I., Koch, C. and Dickson, K. (2001). What's this "T osh"?: Innovation Networks and New Product Development as a Political Process. *International Journal of Innovation Management*, 5(3), 275.
Meier, R., Ben, E. and Schuppan, T. (2013). ICT-enabled public sector organisational transformation: Factors constituting resistance to change. *The International Journal of Government and Democracy in the Information Age*, 18(4), 315-329.
Monk, P. (1989). *Technological Change in the Information Economy.* London: Pinter.
Neirotti, P., Paolucci, E. and Raguseo, E. (2013). Mapping the antecedents of telework diffusion: firm-level evidence from Italy. *New Technology, Work and Employment*, 28(1), 16-36.
Nof, S. (2003). Design of effective e-Work: review of models, tools, and emerging challenges. *Production Planning and Control: The Management of Operations*, 8, 681-703.
Omar, S. and Nordin, F. (2013). Career adaptability and intention to leave amongst ICT professionals: An exploratory study. *Turkish Online Journal of Educational Technology*, 12(4), 11-18.
Orlikowski, W. (1988). Computer Technology in Organisations: Some critical notes. In D. Knights and H. Willmott (Eds.), *New Technology and the Labour Process* (pp.20-49). Basingstoke: Macmillan.
Panayotopoulou, L., Galanaki, E. and Papalexandris, N. (2010). Adoption of electronic systems in HRM: is national background of the firm relevant? *New Technology, Work and Employment*, 25(3), 253–269.
Pinnington, A. and Morris, T. (2003). Archetype change in professional organizations: Survey evidence from large law firms. *British Journal of Management*, 14(1), 85-99.
Pollitt, C. (2010). Engaging public sector clients: From service-delivery to co-production. *International Review of Administrative Sciences*, 76(4), 813-815.
Ritchie, B. and Brindley, C. (2005). ICT adoption by SMEs: Implications for relationships and management. *New Technology, Work and Employment*, 20(3), 205-217.
Sayah, S. (2013). Managing work-life boundaries with information and communication technologies: the case of independent contractors. *New Technology, Work and Employment*, 28(3), 179-196.
Scholarios, D. and Taylor, P. (2010). Gender, choice and constraint in call centre employment. *New Technology, Work and Employment*, 25(2), 101–116.
Shuen, A. (2008). *Web 2.0: A strategy guide.* Farnham: O'Reilly.
Stanworth, J. and Stanworth, C. (1991). *Telework: The human resource implications.* London: Institute of Personnel Management.
Stuchbery, M. (2013). Using Twitter to teach civics and citizenship in a Year 8 classroom. *Ethos*, 21(1), 23-24.
Sullivan, C. (2003). What's in A Name? Definitions and Conceptualizations of Teleworking and Homeworking. *New Technology, Work and Employment*, 18(3), 158–165.
Teich, A., Frankel, M., Kling, R. and Lee, Y. (1999). Anonymous communication policies for the internet: Results and recommendations of the AAS Conference. *Information Society*, 15(2), 71-77.
Thorat, N., Raghavendran, A. and Groves, N. (2013). Offline management in virtualized environments. *Communications of the ACM*, 56(4), 75-81.
Tijdens, K. and Steijn, B. (2002). The determinants of ICT competencies among employee. *New Technology, Work and Employment*, 20(1), 60-73.
Vangelski, L. (2013). Open source cloud computing for sustainable IT develpment. *Journal of Sustainable Development*, 4(7), 20-36.

Vartiainen, M. and Hyrkkänen, U. (2010). Changing requirements and mental workload factors in mobile multi-locational work. *New Technology, Work and Employment*, 25(2), 117–135.
Vayre, E. and Pignault, A. (2014). A systemic approach to interpersonal relationships and activities among French teleworkers. *New Technology, Work and Employment*, 29(2), 177-192.
Vesilind, E. (2010). The home office is humming. *Entrepreneur*, 38(6), 98-103.
Vink, P., Blok, M., Formanoy, M., de Korte, E. and Groenesteijn, L. (2012). The effects of new ways of work in the Netherlands: national data and a case study. *A Journal of Prevention, Assessment and Rehabilitation*, 41, 5081-5085.
Wang, C., Ting, M., Lin, D., Yen, H. and Su, P. (2012). E-work creating for place-based learning (PBL). *International Journal of Technology, Knowledge and Society*, 8(4), 49-64.
Wheatley, D. (2012). Good to be home? Time-use and satisfaction levels among home-based teleworkers. *New Technology, Work and Employment*, 27(3), 224-241.
Woolgar, S. (1981). Critique and criticism: Two readings of ethnomethodology. *Social Studies of Science*, 11(4), 504-514.
Woolgar, S. (1991). The turn to technology in social studies of science. *Science, Technology and Human Values*, 16(1), 20-50.
Woolgar, S. (1993). What's at stake in the sociology of technology? A reply to… *Science, Technology and Human Values*, 18(4), 523-529.
Woolgar, S. (2004). Marketing ideas. *Economy and Society*, 33(4), 448-462.
Woolgar, S. and Cooper, G. (1999). Do artefacts have ambivalence? Moses' bridges, Winner's bridges and other urban legends in S&TS. *Social Studies of Science*, 29(3), 433-449.
Woolgar, S., Coopmans, C. and Neyland, D. (2009). Does STS mean business? *Organization*, 16(1), 5-30.
Woolgar, S. and Grint, K. (1991). Computers and the transformation of social analysis. *Science, Technology and Human Values*, 16(3), 368-378.
Woolgar, S. and Grint, K. (1996). A further decisive refutation of the assumption that political action depends on the 'truth' and a suggestion that we need to go beyond this level of debate: a reply to Rosalind Gill. *Science, Technology and Human Values*, 21(3), 354-357.
Woolgar, S. and Lezaun, J. (2013). The wrong bin bag: A turn to ontology in science and technology studies? *Social Studies of Science*, 43(3), 321-340.
Woolgar, S., Vaux, J., Gomes, P., Exingeard, J. and Grieve, R. (1998). Abilities and competencies required, particularly by small firms, to identify and acquire new technology. *Technovation*, 18(8/9), 575-584.
Yao, L., Bin Othman, A., Aballama, A. and Mahdi, O. (2011). E-management development and deployment strategy for future organization. *African Journal of Business Management*, 5(16), 6657-6667.

Advanced Learning Space as an Asset for Students with Disabilities

RNDr. Klára Císařová, Ph.D.
The Institute of Mechatronics and Computer Engineering, Technical University of Liberec, Studentská 2, 461 17 Liberec, Czech Republic
klara.cisarova@tul.cz

Ing. Marián Lamr, Ing. Jana Vitvarová, PhD.
The Institute of Mechatronics and Computer Engineering, Technical University of Liberec, Studentská 2, 461 17 Liberec, Czech Republic

ABSTRACT
The paper describes an e-learning system called Advanced Learning Space that was developed at the Technical University of Liberec. The system provides a personalized virtual work space and promotes communication among students and their teachers. The core of the system is a module that can be used to automatically record, store and playback lectures. Recently, we extended the system by new features such as sound websites and lecture recordings with a sign language interpreter. This further enables students with disabilities to study the same courses as other students.

Peer-review under responsibility of the Sakarya University.

Keywords: e-learning system, lecture recording, mediasite, sound website, , sign language, subtitling, students with disabilities

1. INTRODUCTION

In the new conditions of a competitive labor market, only well-educated graduates prepared in the best way for the 21st century workforce can succeed. At the Technical University of Liberec (TUL), we are continuously searching for ways to ensure that our graduates reach the highest possible level and as much as possible students complete successfully their studies. We also want to give a chance to the group of students with disabilities. Additionally, we need to take into account the fact, that we are a relatively small regional university with around 9000 students. This defines the pool of students applying to study with us. Bigger and well known universities attract, as expected, top talents but we want also our students to become good even the best in what they do. In order to learn new skills and gain deeper knowledge our students often require additional time and more personal approach. Therefore, we started considering an e-learning system based on new technologies with adaptive elements that will respect our students' individual learning needs, their personality and even their handicap. Our aim was to provide students with friendly supporting tools, where they can flexibly manage their learning path, interact with the teachers and among themselves. The solution should be low-cost and especially should not require time-consuming procedures from teachers.

2. PROJECT ADVANCED LEARNING SPACE

An analysis of the current technologies, current educational opportunities and the situation at the university clearly showed that one of the solutions, that can support our vision of providing high quality education and producing competent and competitive graduates, should be a students and teachers friendly virtual workspace promoting a professional creative atmosphere in the campus. Having this in mind, we developed the Advanced Learning Space (ALS). In the project ALS, which was co-financed by the European Social Fund and the state budget of the Czech Republic, we have built an e-learning portal with integrated technology for automatic recording of lectures. Now ALS offers to the student standard features such as the access to pdf files, powerpoint presentations or testing modules as well as new educational opportunities. Those new mostly comprise a video recording of a lecture synchronously complemented by a data stream coming either from the teacher's laptop, a magnetic board or a visualizer. The Fig. 1. depicts an example, when a video stream is accompanied by a presentation using a visualizer. Students can replay a specific part or a whole lecture, which they found difficult as many times as necessary. Or while revising, they come back to specific topics, where they missed an important point or took inaccurate notes. The teachers, on the other hand, get valuable information from electronic data representing students' access to various educational materials on ALS. They can find out which topics are the most viewed, though probably the most difficult or interesting, how much time students spend on average watching each recording or what time of the day do they usually use the ALS. Based on this information, teachers may decide to adjust their e-learning support as well as their lectures.

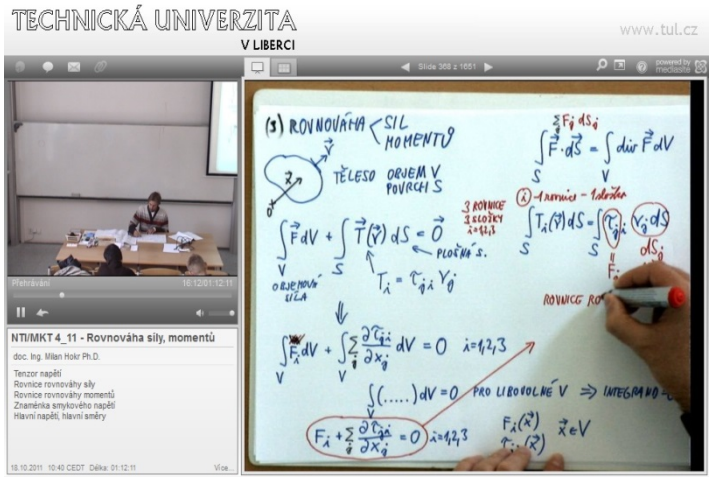


Fig. 1 Lecture recording example – video stream with a data stream from a visualize

2.1. ALS technologies

From the very beginning, we rejected the idea of building ALS from scratch. Modern e-learning is no longer a simple Web catalog of lectures in the form of powerpoint presentations or PDF files but a complex system. The design and development of a comprehensive e-learning solution would have cost us an excessive amount of time, money and manpower. Nor did we intend to repeat the mistakes from previous years of buying a closed commercial system with no scope for our own extensions (Císařová, Kopetschke and Hnídek, 2010).

After considering all the criteria we chose the environment Moodle due to its considerable popularity in academia, open source code and time-tested reliability. We strictly avoid changes to the core of the Moodle in order to maintain the ability of regular updates. Extra features are added through the development of custom modules. The most significant modules are the user authentication, the integration with the university study agenda software and the integration with the storage of the recorded lectures (Císařová, Kopetschke and Hnídek, 2011).

The recording of lectures is based on the technology Mediasite from Sonic Foundry for the moment. The streams of lectures are stored in a special catalog, which is a part of the Mediasite web application. The lectures can be categorized and directly playback through the web browser with an enabled or disabled option for a download. Due to the university security requirement to limit an uncontrolled spread of the lectures outside the university, downloads are forbidden. But then the access to the streams revealed to be the stumbling block. For the above mentioned security reason, the streams were accessible only through specialized user accounts unique for each subject and teacher. However, this proved to be quite impractical. The teacher had to disclose this access information to his students and therefore had no longer control over its misuse. The storage fortunately provides a collection of Web services enabling to establish a connection to an external entity using an authentication ticket and make accessible selected streams within the ticket context, which led to the development of an extension module. This module allows adding a specialized content – a lecture recording to the course. Therefore, students need no longer special access credentials. Once they are subscribed to a course, they automatically see all the lectures published for that specific course. Although, a similar module already exists for Moodle, we developed our own, which enables a higher degree of automation in the selection of streams for a particular course. The hardware solution of the lecture recordings based on the approach “switch on, give lecture and switch off” is described in Svoboda and Vlasák (2013).

2.2. ALS current state

The ALS portal was launched in pilot operation at the beginning of the spring semester in 2011. By January 2014 we had 375 registered authors - teachers and guests who agreed to stream their performances, 320 registered courses and around 4000 recordings of individual lectures and university events viewed 110,550 times. In the moment, the portal is used by two faculties out of seven. More statistical information can be found in Císařová and Kopetschke (2013). The numbers would although require an interpretation. A number of specialized lectures were intended only for a small amount of students and there are as well authors, who decided not to publish their recordings or use the portal only as a simple catalog of learning materials. Nevertheless, these data together with the positive feedback from students give a sense to the work of the whole development team.

3. SUPPORT FOR STUDENTS WITH DISABILITIES

Support for students with disabilities is addressed within the university project "Equal Opportunities", which is co-financed by the European Social Fund and the state budget of the Czech Republic. The aim of the project is to promote various activities creating better studying opportunities and more successful assertion in the labor market for students with special needs. The ALS feature of lecture recordings gives students with disabilities a chance to attend the lectures at least virtually or adapt the playback of the recordings to their needs (Gregová, Lamr and Tyl, 2013). The first may be important in particular for students with immune system disorders especially in times of increased incidence of viral disease. On the other hand, the adaptability of the playback is crucial for visually or hearing impaired students. At the moment, we are working on three adaptation elements; websites enhanced with sound, recording with a sign language interpreter and subtitling of the recording.

3.1. Websites enhanced with sound

Sound websites or websites enhanced with sound target visually impaired student, which represent the largest group of students with disabilities at TUL. The access to the recordings as well as their basic format is not comfortable enough for those students as it was not originally designed for such purpose. Based on the discussions with concerned students, we created a simple intuitive web interface, which makes available recordings directly, not hidden among other e-learning materials. In order to ease the navigation, we use a small number of large elements (buttons or hyperlinks) and a sound system. When the student hovers the mouse over an element, the element's text is played. This way, the student can, for instance, search for a correct button. As there were not many elements at the beginning, our first idea was to read and record the necessary sounds for the elements ourselves. As it turns out, this solution is not very effective and produces unprofessional results. Maintaining the same volume, tone and style of the speech is in our conditions complicated and unfeasible. Another solution especially suitable for larger catalogs of lecture recordings is a use of a commercial synthesizer. The output of the synthesizer is exported into audio files that are incorporated into the site the same way as the sounds recorded by us. Visually impaired students prefer to have only a standalone audio stream. Therefore, we extracted the audio tracks from the original recordings and designed a simple audio player with regards to the students' needs. The Fig. 2. depicts the audio player. It has again large buttons enhanced with sound.

3.2. Recording with sign language interpreter

Another software solution we are currently testing is a recording with a sign language interpreter designated for the hearing impaired students. There are two options; either the online or the on-demand mode. The first option is suitable, when the interpreter's recording can takes place at the same time as the teacher's lecture. The two video inputs, one from the camera recording the speaker and one from the camera recording the interpreter come simultaneously into a hardware device a videomix, where they are in real time layered together and can be broadcast live. In the case of the on-demand mode, the lecture can be taken using the classic one video input device and the recording of the interpreter can take place separately later on. Then, both streams need to be exported and composed using appropriate software tool such as Pinnacle Studio. By using visual effects and various techniques of keying we create an image of the interpreter in the teacher's image. Fig. 3. a) depicts the green-screen composing, where the green background behind the interpreter is filtered and made transparent. Fig. 3. b) depicts, on the other hand, the case, when the background is left.

.

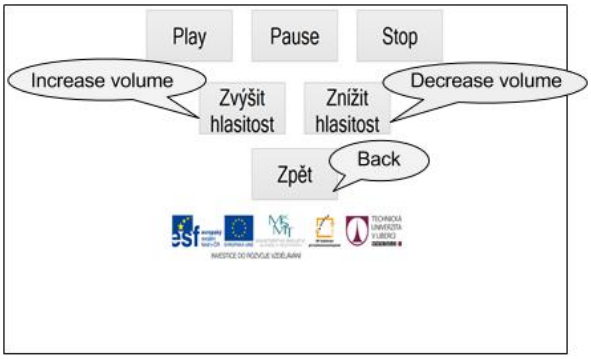


Fig. 2. Audio player for visually impaired

Fig. 3. Examples of (a) a composition with background filtering; (b) a composition without background filtering

3.3. Subtitling

Subtitling or captioning of the recordings is a further enhancement aimed at students with hearing impairments. Again there are several ways of doing it. Individual methods differ in quality and time requirements. Mediasite itself provide support for automatic as well as manual methods. Automatic captioning here means that the stream is sent to a caption provider, who creates the subtitles and sent them back. As there are no caption providers for the Czech language and their services would be presumably quite expensive, this method is in our circumstances not applicable. As mentioned, Mediasite allows manual upload of subtitles created and specified in separate SAMI files. In this case, it is necessary to create subtitles manually using special software. In collaboration with our colleagues from the speech recognition group, we test the possibility to generated SAMI files automatically from the recordings. These automatically generated captions are still not hundred percent accurate. However, they can serve well for searching. As they already contain the right timing - when what text should appear, only the inaccuracies should be corrected manually. Fig. 4. depicts an example of the subtitling.

Fig. 4. Example of subtitling

4. CONCLUSION

New elements of e-learning together with wheelchair access, Braille translations or electronic orientation landmarks at the university premises can cause a real revolution in studying for disabled people. This academic year a student with severe disabilities was able to fully study the Information Technology (IT) specialization at the Faculty of Mechatronics. There was only one first year IT course missing in ALS and around 90% of all the first year IT lectures were recorded and made available to the student. The coverage in higher classes is lower, although continuously increasing.

In the next stage of the ALS development, we plan to provide support for mobile devices (already in progress) and include a virtual shop for electronic university textbooks in the EPUB format. In addition, we would like to implement a module for preventing plagiarism. As described earlier, we are continuously working to make

maximum of the ALS features accessible and usable by disabled students as well. Following asset will be an intelligent magnifier for visually impaired.

REFERENCES

Císařová, K., Kopetschke, I., Hnídek, J. (2010). Inteligentní multimediální e-learningový portál – prostor pro pokročlé vzdělávání. In conference proceedings *MoodleMoot.* Brno

Císařová, K., Kopetschke, I., Hnídek, J. (2011). Moodle 3V1 – I. In conference proceedings *Alternativní metody výuky*. Praha

Vlasák, M., Svoboda, P. (2013). HW řešení učebny 3. tisíciletí na TUL. In conference proceedings *Vysokoškolské studium bez bariér*. Liberec

Gregová, A., Lamr, M., Tyl, P. (2013). Nabídka nových SW řešení na e-learningovém portále ALS na TUL v Liberci. In conference proceedings *Vysokoškolské studium bez bariér*. Liberec

Císařová, K., Kopetschke, I. (2013). *Edukační potenciál současných informačních a komunikačních technologií aplikovaných na TUL aneb vzdělávání pro každého*. Liberec: Technická univerzita v Liberci

Attitudes of Students and Teachers towards the Use of Interactive Whiteboards in Elementary and Secondary School Classrooms

Nuri Balta
Canik Basari University, Samsun/TURKEY
nuribalta@basari.edu.tr

Muharrem Duran
Bozok University, Yozgat/TURKEY
muharremduran@gmail.com

ABSTRACT
Recently much have been invested in the interactive whiteboard educational technology in Turkey. The government is still wishful to spread it to schools of all levels. This study tries to understand teachers' and students' attitudes toward interactive whiteboard technology along with differences in attitudes resulting from some demographic factors. Two parallel surveys consisting of 25 items were applied to 255 students and 23 teachers from three private schools. Students from sixth to twelfth grades and teachers from 15 different branches participated in this research study. The results indicate that interactive whiteboards are highly rated by both teachers and students. Students mostly prefer the usage of interactive whiteboards in math courses, and their attitudes differ across their genders and school levels. As students get elder, their positive attitudes toward interactive whiteboard technology decrease, and it has been found out that there is no difference between teachers' and students' attitudes. This study includes some implications for policy makers, educator and researchers.

Keywords: interactive whiteboard, student attitude, teacher attitude, ICT technology

INTRODUCTION
An interactive whiteboard is an instructional tool that is connected to a computer and a projector and enables the transfer of images from computer to the board. Thus, the instructor can control the related items directly on the screen with a pen or finger. The lecturer can perform various actions with interactive whiteboards such as dragging, clicking, pasting and copying items; taking handwrite notes, transforming them into texts and highlighting those texts; adding annotations, notes and drawings and saving them to be printed out and shared; showing picture animations and educational videos to the whole class; saving and recalling current and previous screens, revisiting, reviewing and amending when required; using contents available on a website.

Most of the studies in the written literature report extremely positive perceptions about the effects and the potential of interactive whiteboard technology (Elaziz, 2008). For instance, many studies report the positive effect of interactive whiteboards on students' success (Holmes, 2009; Lewin, Somekh & Steadman, 2008; Marzano, & Haystead, 2009; Thompson, & Flecknoe, 2003; Yang, Wang, & Kao, 2012; Yorgancı, & Terzioğlu, 2013). A study conducted by Yang, Wang, & Kao (2012) can be cited as an example for the effects of interactive whiteboards on students' success. They designed a quasi-experimental design with sixth-grade students to understand how interactive whiteboards influence students' learning. In their study, two different work groups were designed. One of these groups (n=59) studied in an environment using interactive whiteboards during the teaching process, while the other group (n=59) studied in an environment using conventional information technologies. They showed that students in the first group learned more productively than those in the second group. Besides such studies that show the positive effects of using whiteboards in teaching on students' success, there are some other studies that report the effect of interactive whiteboards as negligible (Glover, Miller, Averis, & Door, 2005; Higgins, Beauchamp, & Miller, 2007; Solvie, 2007).

Many teachers regard interactive whiteboards as valuable teaching tools (Warwick & Kershner, 2008). Interactive whiteboards enable teachers to design and organize activities and lessons using a broad variety of multimodal resources and to engage students' cognitive and innovative potentials into the learning process (Littleton, Twiner, & Gillen, 2010). In addition, interactive whiteboards can be used to deliver the instructions to the students effectively (DeSantis, 2012). As powerful technological devices, interactive whiteboards have the potential to "help teachers convert the ordinary classroom conditions into a student-centered collective environment" (Somyurek, Atasoy & Ozdemir, 2009). The use of interactive whiteboards in classrooms contributes to the learning process through increasing the teachers' proficiency level, facilitating student-centered instructional performances and changing many experienced teachers' attitudes toward technology

(Huber, 2010). Teachers can procure vast digital educational materials through instant access to the Internet and present them to students via interactive whiteboards.

Current research on the interactive whiteboards' use in educational settings reflects several advantages for students. For instance, they develop students' autonomy (Harlow, Cowie, & Heazlewood, 2010; Minor, Losike-Sedimo, Reglin & Royster, 2013) and it has been discussed that they increase student enthusiasm and motivation (Schmid, 2006; Torff & Tirotta 2010; Wood, R., & Ashfield, J. (2008), possess the capacity to ease teaching and learning (Smith et al., 2005; Glover et al 2005), enhance the degree of understanding (Holmes 2009; Wall, Higgins & Smith, 2005) and enable students to participate in the lessons being conducted and provide collaboration in the classroom (Gray et al., 2005; Minor, Losike-Sedimo, Reglin & Royster, 2013).

Information and communication technology (ICT) in education is widely used for effective learning throughout the world. As a type of ICT, interactive whiteboards have so many benefits. Due to this potential, many countries have invested considerably in the installation of interactive whiteboards and struggled to spread this technology to schools of all levels. In terms of installation of interactive whiteboards in schools, the United Kingdom (UK) has made the greatest attempt (Yang, Wang, & Kao, 2012). In many UK primary schools, other teaching tools have almost been completely replaced with interactive whiteboards (Warwick, Hennessy, & Mercer, 2011). In reference to BECTA (2007), the interactive whiteboards has a high prevalence in primary (100%) and secondary schools (98%) of UK.

In Turkey, more than $1 billion have been invested for the development of the elementary and secondary education programs (Somyurek, Atasoy & Ozdemir, 2009). This investment were made in accordance with FATİH Project (The Increasing Opportunities and Improvement of Technology Movement) which was initiated with National Science and Technology Policy 2003-2023 Strategy Document, in November 2010. The aim of this project was to provide equality of educational opportunities in Turkish schools and the most productive usage of information technologies. With this project, it was aimed to provide 570000 LCD Panels and internet network infrastructure in all classrooms of preschool, elementary and secondary education (FATİH, 2014).

Many countries, including USA, Canada, Mexico Taiwan, Japan, Singapore, Malaysia, China and Russia are also aware of the importance of using this technology in classroom teaching, and all these countries are eager to integrate interactive whiteboards in learning and teaching (Yang, Wang, & Kao, 2012). At the end of 2009, interactive whiteboards were installed in 31% of Australian classrooms, 40-42% of classrooms of Denmark and The Netherlands were equipped with interactive whiteboards as well (Lee, 2010).

Significance of the Problem

According to Heuser (2005), interactive whiteboards are used in "more than 1.6 million K-12 classrooms, by more than 40 million students globally." Since the FATİH project was initiated in Turkey, billions of dollars have been consumed in supplying schools with the interactive whiteboards, computers and Internet. Even though Turkey is one of the countries that invest a great deal in interactive whiteboard technology, there is comparatively fewer background or research literature available on interactive whiteboards than the other countries. Most of the studies conducted in Turkey related to interactive whiteboards are about participants' views (Bulut & Koçoğlu, 2012; Gürol, Donmuş, & Arslan, 2012; Kahyaoğlu, 2011) and about the problems that teachers and administrators encounter during the use and placement of the boards (Çiftçi, Taşkaya, & Alemdar, 2013; Keser, & Çetinkaya, 2013; (Somyurek, Atasoy & Ozdemir, 2009; Türel, 2012).

As the quantity of interactive whiteboards in Turkish classrooms is increasing, the productivity of these devices and attitudes toward them in promoting teaching and learning will continue to be questioned. Moreover, as teachers use interactive whiteboards, the attention will turn to pedagogical issues and the attitude towards these boards. Although many countries/schools have enthusiastically adopted interactive whiteboards, only few negative attitudes have been detected against these boards. Since the literature's lack of studies investigating students' and teachers' attitudes towards interactive whiteboards technology (Elaziz, 2008), this study may provide useful results for the literature especially showing how teachers and students perceive interactive whiteboard technology.

Before deciding whether to invest in a new technology or available technologies to screen the current system, policy makers and educators need to know views of education's shareholders such as teachers and students who are to use this technology in the first place. Further research that will include the other shareholders of education like parents/guardians, administrators and other facilitators are a need, especially in Turkey and would be valuable. Minor, Losike-Sedimo, Reglin and Royster (2013) also recommend a research on the attitudes of teachers and students related to technology integration and the interactive whiteboard technology.

METHOD

Research Setting

This study was conducted during the 2011-2012 educational year. The targeted schools were a private secondary school, a private science high school and a private Anatolia high school located in Keçiören district of Ankara. In the Turkish educational system, in terms of student achievement, science high schools rank the first among all other types of schools. The sample of the current study was composed of students and teachers from these schools. The subjected students were at the ages between 11 and 18 (6^{th}-12^{th} grades) studying at primary and secondary education. Teachers had years of teaching experience ranging from one year to 28 years; had branches been ranging from visual arts to physics. Owing to being private schools, the proficiency of these teachers in the use of interactive whiteboards is higher compared to the teachers of public schools. On the other hand, the use of interactive whiteboards has been compulsory in these schools since 2007, and the teachers had seminars on the use of interactive whiteboards four years ago.

The survey was applied to 64 science high school, 67 Anatolian high school and 124 middle school students and 23 teachers (11 high schools and 12 primary schools). The 58% of surveyed students were female and 42% were male. English teachers (6) prevailed among the participant teachers. Before the application of the survey, participants were given information about the purpose and content of the survey. The survey was applied to teachers during the breaks, and to students in the last 20 minutes of the class hours. Moreover, elementary and high-school students were administered on different days.

Purpose and Research Questions

This paper focuses on the interactive whiteboards and analyses on students' and teachers' responses to attitude survey. The purpose of this study was to determine the attitudes of both teachers and students against the use of interactive whiteboards and to determine the differences between their attitudes across their genders, ages and schools. It also compares the attitudes between groups of teachers in different subject areas.
The research questions of this study are listed as follows:

1. What are the attitudes of students towards interactive whiteboards?
    a. Do attitudes differ across courses?
    b. Do attitudes differ for elementary and high schools?
    c. Do attitudes differ across gender?
    d. Do attitudes differ across students' possession of a personal computer?
    e. Is there any relationship between attitudes and the ages of the students?
2. Do attitudes differ for students and teachers?

Instruments

Two different data collection instruments were developed by the researcher to collect data in order to give responses to the research questions. Reliability was established on the instruments using the Cronbach's alpha internal consistency reliability estimates. Data collected from students and teachers were merged and only one reliability coefficient was calculated. The overall reliability estimated for the instruments was measured as .92. Therefore, the instruments are considered to be highly reliable.

The primary validity evidence appropriate to the instrument was content validity. To enhance content validity of the instrument, three experts; two experts from a university and one experienced teacher from a private high school carefully reviewed all items of the instrument. The experts were asked to review the instruments for unclear directions, vague items and words, and the appropriateness of the scale. The experts mostly offered changes about the parallelism of the items on both instruments. Additionally, two unnecessary items were excluded, and two akin items were reduced to one item concerning experts' opinions.

Finally, there were 25 items on the survey along with some extra demographic items. Two typical items on the surveys were: "interactive whiteboard is a great technology" and "course is enjoyable when interactive whiteboard is used." In the five-point Likert-type scale used in this study, 5 corresponded to 'strongly agree, 4 'agree, 3 'neutral, 2 'disagree' and 1 'strongly disagree'. Hence, a score below 3 on this scale denoted a negative attitude, a score close to 3 a neutral attitude and a score above 3 a positive attitude.

Data collection and analysis

Data presented in this paper come from the survey administered to students and teachers in three private schools possessing and actively using interactive whiteboards. Before the application of the survey participants were given information about the purpose and content. Survey was administered to teachers during the breaks, applied to students during the last minutes of the class hours. The survey consisted of 25 short items and took approximately 20 minutes to complete.

In this paper, the descriptive statistics calculated were the means and percentages. The inferential statistical models used were the t-test for independent samples, correlation for relationship and linear regression for prediction. The research questions were tested at an alpha level of .05.

FINDINGS

Do attitudes differ across courses?

In the course of the use of interactive whiteboards, students were asked: "Which lesson do you like most?" Students pointed out 15 different lessons ranging from German language to Biology lessons which they enjoy the usage of the interactive whiteboards in. The percentage of the branches that the students like the interactive whiteboards to be used in is given in Table 1.

Table 1: The percentages of attitudes across branches

Lesson	%	Lesson	%	Lesson	%
German L.	2.8	Visual arts	.4	Geometry	5.9
Physical education	2.0	English	11.0	Physics	3.1
Biology	4.7	Chemistry	1.2	Turkish L.	4.3
Geography	4.7	Maths.	33.5	Science and technology	5.9
Literature	.4	Social sciences	8.3	History	11.8

Table 1 shows that students mostly like the use of interactive whiteboards in math lessons (33.5) and at least in literature (.4) and visual arts (.4). There is a significant supremacy of math course, the nearest course (History) legs 21.7 percentages behind the math.

Do attitudes differ for elementary and high schools?

A total of 131 high school and 124 elementary school students responded the survey questions. There were 25 items on the survey, and it was scored between 5-1 indicating the positive and negative attitudes. The maximum possible score for each participant was 125. The mean of the high-school students was calculated as 83.5 with a standard deviation of 20.8 and the mean of elementary school students was calculated as 104.3 with a standard deviation of 15.6. Both the mean and the spread of the high-school students' scores are lower than those of elementary school. The related statistical analysis, the independent sample t test results are shown in Table 2.

Table 2: t test results for attitudes of high and elementary schools

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	8.03	.005	-9.01	253	.000	-20.79
Equal variances not assumed			-9.08	240.67	.000	-20.79

As seen on Table 2 the difference, attributed to attitude, between elementary and high-school students, is highly significant ($p<0.000$). According to this result elementary school students have more positive attitude towards interactive whiteboards when compared to high-school students.

Do attitudes differ across gender?

Of the surveyed students, 58% were female and 42% were male. While the mean of the scores of the males was 100.4, that of females was 88.8 showing male students having more positive attitudes toward the interactive whiteboards. The results of the independent t-test conducted for the difference between male and female students' attitudes is indicted in Table 3.

Table 3: t test results for attitudes of male and female students

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	5.47	.020	4.51	253	.000	11.67
Equal variances not assumed			4.66	247.10	.000	11.67

Table 3 shows that attitude toward interactive whiteboards differs for male and female groups and in fact, the difference between groups is highly significant (p<0.000).

Do attitudes differ across students' possession of a personal computer?
Of the 255 participant students, 168 had a personal computer, and 87 didn't have one. The means of the students having and not having a personal computer are 93.7 and 93.5 respectively. Having had a computer may affect students' attitudes against the interactive whiteboards. To shed light on this possibility t-test was conducted. Table 4 indicates independent t test results.

Table 4: t test results for attitudes of students having and not having a personal computer

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	2.55	.111	.066	253	.95	.18
Equal variances not assumed			.067	183.46	.95	.18

Table 4 shows the mean difference for student's possession of a computer is only .18. This is quite low to result in a significant difference. The conduction of t test resulted in no statistical significant difference (p > .05)

Is there any relationship between attitudes and the ages of the students?
Students at different grades at the ages ranging from 11 to 18 participated in this study. Correlating the attitude with the ages of students considered to be valuable. The relationship between attitudes and the ages of the students is indicated in Table 5.

Table 5: Regression results for attitude and the age

Model Summary		ANOVA					Coefficients		
R	R Square	Model	df	Mean Square	F	p	Model	B	p
-.55	.304	Regression	1	34439.07	110,44	.000	(Constant)	170.19	.000
		Residual	253	311.83			Age	-5.50	.000
		Total	254						

The Pearson correlation results indicated that there is a moderate correlation of -.55 among the age and attitude showing that as students get elder, they gain more negative attitudes against interactive whiteboards. Linear regression is the next step up after correlation. Linear regression is used to understand whether students' attitude can be predicted based on their age. The R^2 value in Table 5 indicates how much of the "attitude" can be explained by the independent variable; "age". In this case, 30.4% can be explained as a high figure. The ANOVA result indicates the statistical significance of the regression model that was applied. Table 5 shows that p = .000, which is less than .05, and indicates that, overall, the age can statistically significantly predict the attitude of students. By referring to Table 5, we can present the regression equation as:
Attitude = 170.19 -5.50*Age.

Do attitudes differ for students and teachers?
For this study, 22 teachers at aforementioned schools were surveyed. Nine were male and 13 were female teachers. The teachers were from 14 different branches and six of them were English language teachers. The mean attitude score for teachers were calculated as 98.1 indicating a mean score slightly above that of students (93.6). Since the surveys applied to students and teachers were parallel; it is safe to compare the gathered scores. For instance, a pair of parallel questions was as follows: Student: "I understand the content easier when interactive whiteboard is used" and teacher: "I teach the content easier when interactive whiteboard is used." Moreover, ten items were completely same. For instance, one of those was: "I have positive feelings towards interactive whiteboards."

There were 255 students and 22 teachers completing the survey. The comparison of the attitudes was performed via independent t-test and, the results are shown in Table 6.

Table 6: t test results for attitudes of students and teachers

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	.189	.664	-.96	275	.337	-4.49
Equal variances not assumed			-1.04	25.61	.306	-4.49

Table 6 indicates that teachers and students almost have similar attitudes towards the interactive whiteboards. The independent t test resulted in no significant difference ($p>.05$).

DISCUSSION

In this study, the answers given to seven important questions and sub-questions attributed to the attitudes of students and teachers towards the interactive whiteboards were examined. As a result of this research study, several valuable results were obtained. First of all, interactive whiteboards were highly rated by both teachers and students. This is consistent with recent research that has broadly established that students and teachers report favourable feedbacks about interactive boards (Hall & Higgins, 2005; Kennewell & Morgan, 2003; Mathews-Aydinli, & Elaziz, 2010; Moss et al., 2007; Öz, 2014; Schmid, 2006; Wall, Higgins, & Smith, 2005). Teachers' positive attitudes are consistent with the findings of several other researchers (Elaziz, 2010; Lai, 2010; Xu & Moloney, 2011). Likewise, students' favorable attitudes are consistent with findings of Elaziz (2010), Lisenbee (2009), and Morgan (2008). Moreover, in terms of attitudes, the results of this study are consistent with the studies conducted by Erdem, (2012) and by Ateş (2010) in private schools. Furthermore, there are studies conducted in public schools indicating positive effects of interactive white boards on students' attitudes (Yorganci & Terzioğlu, 2013; Zengin, Kırılmazkaya & Keçeci, 2011).

Secondly, this study indicated that students' attitudes differ across the gender, the mean of the scores of the males was significantly higher than that of female students showing male students having more positive attitudes toward the interactive whiteboards. This result is contrary to the finding of Morgan (2008) who showed that males displayed fewer at-task behaviours during observations when the interactive whiteboards was not in use than did females. Similarly, the study conducted by Öz (2014) showed that there was no difference in terms of gender. Likewise, similar results were reports by Yuan and Lee (2012) who showed that there was no gender difference on perceptions toward Magic Boards. Thus, the findings of this study contradict with the up to date research on the effect of interactive whiteboards on the independent variable gender. This implies that more researches are needed to have appropriate decisions for whether gender difference affects the attitude towards interactive whiteboards.

Four of the findings of this study are remarkable. First, the correlational analysis between age and attitude showed that as students get elder their positive attitudes decrease. The prediction of attitude from age can be deduced form the equation; Attitude = 170.19 -5.50*Age. Second, in dependent sample t-test results indicated that there was no differences between the attitudes of teachers and students. Third, students mostly prefer the usage of interactive whiteboards in math courses. Fourth, students' attitudes differ across school levels. However, no results in the literature were detected to compare these four findings.

CONCLUSION

To conclude, the attitudes of teachers and students toward the uses of interactive whiteboards exhibit a very favorable description overall. Despite everything, the private school teachers' and students' positive attitudes toward the use of the interactive whiteboards in classrooms may influence MoNE policymakers in two ways: First, positive attitudes of private school participants indicate that these schools have eliminated the factors such as the lack of interactive whiteboard related in-service training, lack of digital educational material, lack of assistance and maintenance, and administrative affairs (Somyurek, Atasoy & Ozdemir, 2009) that negatively affect the attitudes of teachers and students. Policy makers may observe the teachers' and students' practices with the whiteboards in private schools and transfer the gained experiences to public schools. Second, by referencing to the private schools they confidently may continue to make investments on new technology integration to public schools.

Moreover, positive feelings of students towards the boards may encourage teachers from all over the world to use these devices and to engage students with interactive white boards in their courses. Since this study has provided evidence about teachers' and students' attitudes toward interactive whiteboards, it would be interesting to compare this research's findings with those of other countries.

Although the outcomes obtained through this study have a potential to be used as a resource by future researchers, it still has several limitations. The proportion of private schools to public schools in Turkey is only about 1%, and this study is limited with only a small portion of these private schools which is located in Ankara. On the other hand, the sample of teachers in the study had a professional development program on the usage of interactive whiteboards which is an important factor that may have affected teachers' and students' attitudes.

As a country in search of compensating its gap in terms of meeting ICT needs of the 21st century, the results of this study are expected to shed light for policy makers and educators in Turkey. The future investments in education should be made using the resources effectively, taking views of the shareholders of education, especially teachers and students into account. Thus, time would not be wasted, and better educational outcomes would be achieved. Since only a few studies conducted in Turkey were found attributed to the attitudes of the school teachers and students towards interactive whiteboards, the results of this study are substantial. Especially, in terms of comparability this study will be valuable for future research and educational investments.

RECOMMENDATIONS AND FUTURE RESEARCH

- Students' attitudes towards interactive whiteboards may be effected by the way in which their interactivity is used and developed in classroom practice. Research is needed to explore the ways teachers use these tools and its effect on students' attitudes and learnings.
- Experimental studies on the effect of the interactive whiteboards usage on students' achievement can be conducted.
- Patterns of the usage of interactive whiteboards in higher educational institutes and their effect on university students can be investigated.
- Collaboration should be provided by the government so that teachers can share practical issues with using the interactive whiteboards.
- Research is needed to understand the match between interactive whiteboards technology and pedagogy.
- More classroom observations are needed to investigate to what extent educators actually make use of the capabilities of these interactive boards.

REFERENCES

Ateş, M. (2010). Ortaöğretim coğrafya derslerinde akıllı tahta kullanımı. *Marmara coğrafya dergisi, 22*, 409 – 427.

Bulut, İ & Koçoğlu, E. (2012). Sosyal bilgiler öğretmenlerinin akıllı tahta kullanımına ilişkin görüşleri (Dıyarbakır ili örneği). *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi, 19*, 242-258.

Bates, C., Hopkins, A., & Kratcoski, A. (2012). Using smart boards to enhance student learning. *Journal of the Research Center for Educational Technology, 3*(2), 47-49.

Çiftçi, S., Taşkaya, S. M., & Alemdar, M. (2013). The opinions of classroom teachers about FATIH project. *Elementary Education Online, 12*(1), 227-240.

DeSantis, J. (2012). Getting the most from your interactive whiteboard investment: Three guiding principles for designing effective professional development. The Clearing House: *A Journal of Educational Strategies, Issues and Ideas, 85*(2), 51-55.

Elaziz, M. F. (2008). *Attitudes of students and teachers towards the use of Interactive whiteboards in EFL classrooms* (Doctoral dissertation, BILKENT UNIVERSITY).

Erdem, Y. (2012). Ortaöğretim Öğrencilerinin Fizik Dersinde Akıllı Tahta Kullanımına Karşı Tutumları. *21. Ulusal Eğitim Bilimleri Kongresi*, 12-14 Eylül 2012, İstanbul.

FATİH (2014). *Eğitimde fırsatları artırma teknolojiyi iyileştirme hareketi projesi. Proje hakkında*. Retrieved July, 2014 from http://fatihprojesi.meb.gov.tr/proje_hakkinda.

Glover, D., Miller, D., Averis, D., & Door, V. (2005). The interactive whiteboard: a literature survey. *Technology, Pedagogy and Education, 14*(2), 155-170.

Gray, C., Hagger-Vaughan, L., Pilkington, R., & Tomkins, S.-A. (2005). The pros and cons of interactive whiteboards in relation to the key stage 3 strategy and framework. *Language Learning Journal, 32*(1), 38-44.

Gürol, M., Donmuş, V., & Arslan, M. (2012). İlköğretim kademesinde görev yapan sınıf öğretmenlerinin fatih projesi ile ilgili görüşleri. *Eğitim Teknolojileri Araştırmaları Dergisi, 3*(3).

Hall, I., & Higgins, S. (2005). Primary school students' perceptions of interactive whiteboards. *Journal of Computer Assisted Learning*, 21(2), 102–117.

Harlow, A., Cowie, B., & Heazlewood, M. (2010). Keeping in touch with learning: the use of an interactive whiteboard in the junior school. *Technology, Pedagogy and Education, 19*(2), 237-243.

Heuser, D. (2005). Teaching without telling: Computational fluency and understanding through intervention. *Teaching Children Mathematics, 11*, 404-412.

Higgins, S., Beauchamp, G., & Miller, D. (2007). Reviewing the literature on interactive whiteboards. *Learning, Media, & Technology, 32*(3), 213-225.

Holmes, K. (2009). Planning to teach with digital tools: Introducing the interactive whiteboard to preservice secondary mathematics teachers. *Australasian Journal of Educational Technology, 25*(3), 351–365.

Huber, C. (2010). Professional Learning 2.0: Moodle. Wikis. Twitter. Ning. It's a whole new way of talking about professional learning. *Educational Leadership, 67*(8), 41-46.

Kahyaoğlu, M. (2011). İlköğretim öğretmenlerinin fen ve teknoloji dersinde yeni teknolojileri kullanmaya yönelik görüşleri. *Eğitim Bilimleri Araştırmaları Dergisi, 1*(1), 79-91.

Kennewell, S., & Morgan, A. (2003). Student teachers' experiences and attitudes towards using interactive whiteboards in the teaching and learning of young children. In Proceedings of the international federation for information processing working group 3.5 open conference on Young children and learning technologies-Volume 34 (pp. 65-69). *Australian Computer Society, Inc.*.

Keser, H., & Çetinkaya, L. (2013). Öğretmen ve öğrencilerin etkileşimli tahta kullanımına yönelik yaşamiş oldukları sorunlar ve çözüm önerileri. *Electronic Turkish Studies, 8*(6).

Lai, H.-J. (2010). Secondary school teachers' perceptions of interactive whiteboard training workshops. A case study from Taiwan, *Australasian journal of educational technology*, 26 (4), 511-22.

Lewin, C., Somekh, B., & Steadman, S. (2008). Embedding interactive whiteboards in teaching and learning: The process of change in pedagogic practice. *Education & Information Technologies, 13*(4), 291-303.

Lee, M. (2010). Interactive whiteboards and schooling: The context. *Technology, Pedagogy and Education, 19*(2), 133-141.

Littleton, K., Twiner, A., & Gillen, J. (2010). Instruction as orchestration: Multimodal connection building with the interactive whiteboard. *Pedagogies: an international journal, 5*(2), 130-141.

Morgan, G. L. (2008). Improving student engagement: use of the interactive whiteboard as an instructional tool to improve engagement and behavior in the junior high school classroom, PhD, school of education, Liberty University.

Marzano, R. J. (2012). Teaching with interactive whiteboards. *Educational Leadership, 67*(3), 80-82.

Minor, M., Losike-Sedimo, N., Reglin, G., & Royster, O. (2013). Teacher Technology Integration Professional Development Model (SMART Board), Pre-Algebra Achievement, and Smart Board Proficiency Scores. *SAGE Open, 3*(2), 1-10.

Moss, G., Jewitt, C., Levaaic, R., Armstrong, V., Cardini, A., & Castle, F. (2007). The interactive whiteboard, pedagogy and pupil performance evaluation. Retrieved from http://www.pgce.soton.ac.uk/ict/NewPGCE/pdfs%20IWBs/The%20interactive%20whiteboard,%20pedagogy%20and%20pupil%20performance%20evaluation.pdf

Nolan, K. K. (2008). SMARTer music teaching: Interactive whiteboard use in music classrooms. *General Music Today. 22* (2), 3-11.

O'Connor, Catherine, M. (2011). Teachers hold the real keys to whiteboard effectiveness. *Education Week, 30* (35) 13-15.

Öz, H. (2014). Teachers' and students' perceptions of interactive whiteboards in the English as a foreign language classroom. *The Turkish Online Journal of Educational Technology*, 13(3), 156-177.

Picciotto, H. (2012). Why I use interactive whiteboards. *Mathematics Teacher, 104*(4), 250-253.

Schmid, E.C. (2006). Investigating the use of interactive whiteboard technology in the English language classroom through the lens of a critical theory of technology. *Computer Assisted Language Learning: An International Journal*, 19(1), 47–62.

Schmid, E. C. (2007). Enhancing performance knowledge and self-esteem in classroom language learning: The potential of the ACTIVote component of interactive whiteboard technology. *System, 35*(2), 119-133.

Smith, H.J., Higgins, S., Wall, K. & Miller, J. (2005). Interactive whiteboards: boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning 21*(2), 91–101.

Solvie, P. (2007). Leaping out of our skins: Postmodern considerations in use of an electronic whiteboard to foster critical engagement in early literacy lessons. *Educational Philosophy & Theory, 39*(7), 737-754.

Thompson, J., & Flecknoe, M. (2003). Raising attainment with an interactive whiteboard in Key Stage 2. *Management in Education, 17*(3), 29-33.

Torff, B. & Tirotta, R. 2010. Interactive whiteboards produce small gains in elementary students' self-reported motivation in mathematics. *Computers & Education, 54*(2), 379–383.

Türel, Y. K. (2012). Teachers' Negative Attitudes towards Interactive Whiteboard Use: Needs and Problems, *Elementary Education Online, 11*(2), 423-439.

Yang, K-T., Wang, T-H, & Kao, Y-C. (2012). How an interactive whiteboard impacts a traditional classroom. *Education as Change, 16*(2), 313-332.

Wall, K., Higgins, S. & Smith, H.J. 2005. 'The visual helps me understand the complicated things': Pupil views of teaching and learning with interactive whiteboards. *British Journal of Education Technology 36*, 851–867.

Yorgancı, S., & Terzioğlu, Ö. (2013). Matematik öğretiminde akıllı tahta kullanımının başarıya ve matematiğe karşı tutuma etkisi. *Kastamonu Eğitim Dergisi*, *21*(3), 919-930.

Yuan, Y., & Lee, C. Y. (2012). Elementary School Teachers' Perceptions toward ICT: The Case of Using Magic Board for Teaching Mathematics. *Turkish Online Journal of Educational Technology-TOJET*, 11(4), 108-118.

Xu, H. L. & Moloney, R. (2011). Perceptions of interactive whiteboard pedagogy in the teaching of Chinese language, *Australasian journal of educational technology*, 27 (2) 307-325.

Warwick, P., & Kershner, R. (2008). Primary teachers' understanding of the interactive whiteboard as a tool for children's collaborative learning and knowledge-building. *Learning, Media and Technology, 33*(4), 269–287.

Warwick, P., Hennessy, S., & Mercer, N. (2011). Promoting teacher and school development through co-enquiry: developing interactive whiteboard use in a 'dialogic classroom'. *Teachers and Teaching: Theory and practice, 17*(3), 303-324.

Wood, R., & Ashfield, J. (2008). The use of the interactive whiteboard for creative teaching and learning in literacy and mathematics: A case study. *British Journal of Educational Technology, 39*(1), 84-96.

Zengin, F.K, Kırılmazkaya, G. & Keçeci, G. (2011). *Elementary students use of smart board the effect of achievement and attitude in science and technology course*. 5th International Computer & Instructional Technologies Symposium, 22-24 September, Fırat University, ELAZIĞ- TURKEY.

Benefits and Challenges of Information and Communication Technologies (ICT) Integration in Québec English Schools

Jihan Rabah
Concordia University, Department of Education, LB 578-4, 1455 de Maisonneuve Boulevard West
Montréal, H3G 1M8, Québec, Canada
j_rabah@education.concordia.ca

ABSTRACT
This paper investigated teachers' and educational consultants' perceptions of ICT integration in Québec English Schools, specifically with regards to the benefits and challenges of ICT integration therein. 23 teachers and educational consultants from seven different school boards participated in the focus group sessions. Results revealed higher student engagement levels, glocalization of the 21st century education and enhancement of the learning process as the main benefits of integrating ICT in English Québec Schools. In addition, participants highlighted the following challenges: lack of supporting school leadership, inconsistent investments in ICT equipment, infrastructure and resources, inflexibility of funding, the need for additional professional development and support and incorporation of technology in evaluations and curricular plans.

Benefits and Challenges of ICT integration in Québec English Schools
The job demands of our present era require individuals who are knowledgeable in their fields and who are technologically savvy. Since technology is a powerful and flexible tool for learning, it is needed and desired to meet globalization challenges, to advance our country's economical status, and to motivate and aid students to learn better. In fact, technology is being integrated in educational institutions all around the country to make sure that Canadian citizens meet global technological criteria. The knowledge and communication breakthroughs that the world can achieve using information communication technologies (ICT) are so numerous that educational institutions are striving to invest in ICT tools in an attempt to help raise citizens who are ready to face the challenges of the 21st century where media, manufacturing industries as well as commerce have become increasingly technology-oriented. ICT tools integration is becoming a *sine qua non* in schools. The primary goal of educational technology as applied to pedagogical contexts is to facilitate the teaching/learning process. Accompanying this evolution has been ongoing research into the relative effectiveness and efficiency of educational technology to enhance learning and achievement.

Many researchers claim that the successful incorporation/implementation of ICT in schools still faces myriad obstacles along the way (BECTA, 2004; Hew & Brush, 2007). Lim (2002) suggests that researchers need to take a more contextual approach when studying ICT integration in education, taking into consideration the environment in which ICT is being used (Lim, 2002). Tondeur, Devos, Houtte, Braak, and Valcke (2009) add that useable solutions can emerge only after taking into consideration the structural and cultural aspects of the school where ICT is being integrated. The structural aspects of the settings that need to be taken into account comprise elements such as the distribution of classroom space and resource availabilities and distribution, support and maintenance of ICT integration. The cultural aspects could include a school's vision and mission for ICT integration or adequate guidance and support for all stakeholders involved in the process (Tondeur et al., 2009).

In my paper titled *A Holistic Approach to Technology Integration in Education* (Rabah, *in press*), I highlight the importance of drawing a contextual delineation when investigating ICT integration in educational settings. From this viewpoint, it would be inappropriate to view ICT-based education without taking into consideration the school's context, setting and environment. The classroom 'micro-level' issues can only be fully appreciated after having taken into consideration the entire perspective in which educational technology is situated such as the school's infrastructure, vision and mission. The 'meso-level' of the administrative infrastructure and objectives of the school as well as the 'macro-level' of a broader perspective of socio-political and/or ministerial policies surrounding the school and the classroom have also to be taken into consideration. Differentiating between those levels certainly does not mean that one is above the others in standing. However, it draws an understanding of 'the intimate connectedness' between 'wider contexts and conceptualisations' and the 'merely particular' (Webster, 2005, p.453). I am not denying the unquestionably constant attention that should be warranted to the 'micro-level' of the teacher and student in the classroom; however, we need to contextualize it, especially as related to the ongoing significance of environmental-level contexts in impacting learning.

A contextual delineation when analyzing ICT integration is especially appropriate in pedagogical settings like the Québec English Schools. The Advisory Board on English Education's (ABEE) report titled *One Size Does*

not Fit All is addressed to the Minister of Education and delineates the special situation of Québec English school boards and recounts their special situation (ABEE, 2013). The English school boards cover broad, large territories with some areas three times bigger than any of the French school boards. In fact, some English school boards cover geographical areas that are the size of Belgium in terms of territory. Distances between schools and centres are at times enormous. English school boards also have declining school enrolment rates even though they cover a wider scattered population of students than the French school boards. This results in very small school populations in certain areas, which affects the quality of education and funding. Some English school boards have fewer personnel and resources to service their student population, which is smaller in number but as diversified as other schools. Personnel carry many responsibilities because of lack of budget availability. For example, a technology consultant could be responsible for technology, adult education, and physical and social sciences dossiers. English schools have more special needs students than the French sector and less access to professional services from psychologists, speech therapists and the like. Those aforementioned contexts raise serious different challenges to the boards to provide the students with quality education.

In light of the above, the main purpose of this study is to reveal the perceptions of teachers and key informants regarding the main benefits and challenges to ICT integration in pedagogical settings such as the English Québec Schools. Ertmer, Addison, Lane, Ross, and Woods (1999) highlight the importance of delineating the affordances as well as the constraints perceived by stakeholders when researching proper integration of ICTs in schools. Adopting such a contextual perspective to ICT integration in schools is important, especially when conducting studies in education, for the result should not be "simply knowledge, but useable knowledge" (Lim, 2002, p. 411).

RESEARCH OBJECTIVE

This study addresses the following main objective:
To gauge teachers' and educational consultants' perceptions of benefits and challenges of ICT integration in Québec English Schools' context.

RESEARCH METHODOLOGY

This study was conducted following a qualitative research methodology. The primary source of data collection consisted of focus group sessions. In January 2014, three focus groups[1] were conducted with a total of 23 teachers, and key informants, i.e. educational consultants from seven different Québec English school boards. Participants were selected by the Director General of their respective school boards to participate in this research study. The focus groups were conducted to solicit information from the aforementioned participants and initiate an open-ended discussion to voice the benefits and challenges of implementing ICT in their respective schools. A copy of the focus group questions is provided in *Appendix A*.

For the analysis of my data, I used Glaser's grounded theory, which hypothesizes that the theory is the product of data and cannot be separated from the manner by which it is obtained (Glaser, 1978). Consequentially, queries, theories, and conceptions are produced from the data and resolved during the ongoing progress of the research (Glaser & Strauss, 1967). " By its very nature grounded theory produces ever opening and evolving theory on a subject as more data and new ideas are discovered. This nature also applies to the method itself and its methodology" (Glaser, 1978, p. ix).

Glaser created the grounded theory methodology for qualitative data analysis basing it on his experience in positivism (Glaser, 1978). Glaser asserts that he used the methodology of statistical analysis as a paradigm for the qualitative method in grounded theory (Glaser, 1992). Therefore, the paradigm for quantitative analysis furnishes the distinctiveness of the aforementioned qualitative approach.

In terms of researcher positioning, I saw myself in this study operating from a post-positivist ontological stance. Being one of the research representatives of ABEE, who initiated the research, I felt I was an outsider, detached from the participants in the process. I was recording the participants' answers and collecting their voices. My perceived stance facilitated the collection of unbiased data and representing teachers' and consultants' views as precisely as possible. Participants noted at the end of each focus group that they felt empowered and were pleased by the fact that representatives from the ABEE were listening to their inputs and teachers and consultants' voices were being heard.

[1] *Each focus group consisted of seven or eight participants subdivided into different education cycles.*

Focus group discussions and interviews were audio-recorded and then transcribed. Data analysis process started with open coding. Then subsequent categorization of codes was done in order to develop an emergent set of themes from the collected data. During the analysis process, I continuously related back to the codes and constantly classified the data to ensure that only the codes that repeated themselves were used to construct the themes discussed in the results. This method enabled me to approximate theoretical saturation. The thematic findings that arose from the analysis of data are presented here below.

RESULTS

Perceived main benefits of ICT integration in English Québec schools

Higher student engagement levels. Participants highlighted that when they integrate ICT in their classrooms, they grab the attention of students that are in their turn using these tools outside in their regular lives. Furthermore, educational technology aids teachers deliver diversified instruction to a larger number of students. It also allows learners more autonomy, more cooperative learning, while individualizing information and resources related to the students' needs and interests, all of which can help secure higher student engagement levels. One participant noted, *"The engagement level whenever you pull out any technology in the classroom is so elevated in comparison to paper and pencil. Looking at the world, we have to prepare the kids for that"*.

English Québec schools high inclusion rate of special needs students is significant. Students particularly benefit from assistive technologies in the classroom. Assistive technology could be any technological tool that a student uses to cater for a specific identified need important for completing a certain learning task whether it helps in planning for the task, organizing it, producing and/or sharing an output. One teacher noted, *"We don't really have any studies, just anecdotal. Some students started using electronic readers last year as assistive technologies. Teachers noted dramatic results including higher confidence levels"*. With the help of technology, peer tutoring is also facilitated as a method for engaging students. A very excited participant noted *"I am at a school where I have many students with learning difficulties and challenges…I have students that don't engage a lot when holding a pencil but will do a lot more if they engage with "Audio Boo" or "Siri" and writing an assignment in a different way. They are still producing…and when it is published online and see their work being seen outside their binder…such as in a digital portfolio…or out there on the Internet where someone can give them immediate feedback…their academic performance goes up"*.

Glocalization of the 21st century education. Educational technology gives teachers the affordances of connecting the local classroom to global places. The global world can be opened up in the classroom. Through visual conferencing English school boards have the opportunity to communicate with people from all around the world. In that way, global connections increase and richer learning opportunities are available to students including more collaborative learning opportunities. One participant mentioned the delight of the students when they met with the author of a book they were reading by a video conferencing interview. *"One of the things that we did recently was that we had a Skype session with an author and that went very well. The kids were really excited"*.

Enhancement of the learning process. Using ICT in the classroom, teachers have the opportunity to develop their lesson plans, make it more inquiry-based, project-based or collaborative-based. There are a plethora of opportunities for students to benefit from technology in the classrooms. They range from simple browsing of the World Wide Web, to using word processors, presentation tools and professional graphic software. Participants mentioned the benefit of integrating technologies in lesson plans, relating to Puentendura's (2006) SAMR model. According to the participants, ICT integration in English Québec schools is still in its potential phase especially as it relates to the SAMR model where only the first two levels are currently integrated in most classrooms. *"Right now what we see in the classrooms are the Substitution and the Augmentation. We don't see the Modification and the Redefinition. Technology allows us to go towards the Modification and the Redefinition where we do things we couldn't do before. Some are starting to bud out. Some teachers can do it all the way through SAMR. But little pockets here and there. We are still waiting for this higher level of integration to pick up."*

Perceived main challenges of ICT integration in English Québec schools

Many educational technology equipment and software integrated in schools are not being utilized in manners that notably improve education and instruction. Participants perceived the following main challenges with regards to the ICT integration in English Québec Schools.

Lack of supporting school leadership. With regards to ICT integration in schools, the participants perceive that school principals' leadership as one of the most important catalysts affecting the successful integration of those tools. Institutions should clearly work towards vision and mission for technology integration, planning for it

comprehensively, and connecting the dots of technology investments to classroom uses. Without supporting school leadership and vision, ICT integration will be limited to isolated initiatives like investments or training sessions. According to the interviewees, integrating technology in schools requires a clear vision from the leaders at the school. One consultant said, *"Our current director is devoted in promoting iPads in the classroom. He has pushed many of us towards training sessions and sharing sessions in order to promote the use of iPads in the classroom. We didn't feel that with the previous director"*.

Inconsistent investments in equipment, infrastructure and resources. ICT integration in education requires large budgets and financial investments. Investments should not involve only purchasing new equipment and software but also developing school infrastructures for example by installing Wi-Fi, adapting classroom settings where necessary and/of course refurbishing and maintaining existing equipment. After all, some existing school classrooms are not designed to incorporate ICT when they were initially built. They do not have enough plugs or the classroom walls might be getting in the way to proper Wi-Fi distribution and the like. Participants noted: *"We suffer and struggle from broadband so that ICT keep on functioning and don't crash. Access in our centers is pretty tricky"*. Another participant said: *"I have only one outlet in my class. It is connected to the plug in the hall as well as my neighbor…our school buildings are simply too old to support technology"*.

Inflexibility of funding. Last but not least, when ministerial funding is diffused to the school boards, it is usually policy-based and standardized regardless of whether or not the funding fits the needs and preference of individual school boards. Funding policies that are set equal across all English boards is very challenging for schools to manage with, because operationally there is a lot of difference in terms of school needs and equipment. One example mentioned by participants is the Ministry's policy of buying equipment only from certain specified technology vendors. Teachers complained: *"We have a restriction policy by the Ministry that allows us to buy only certain devices and not others...it may not be about the tool…but it is also about how comfortable you are [as a teacher] with the tool you use…"*

Need for additional professional development and support. The next challenge addressed by participants is the fact that teachers need more training and support for integrating technology when it comes to day-to-day classroom instruction so that integration is more successful across most classrooms. Some highlight the fact that although standard professional development sessions are held three or four times a year to train teachers to use the technology and the equipment, it is not enough. Technical support and pedagogical support are insufficient. If a computer problem occurs, whether at the level of lesson planning or at the level of technical problems that the teacher and students cannot solve, there may be long delays before help is available to address it. Thus teachers feel they are not supported with these new tools. In light of that, they do not prepare to utilize it for integral parts of their lessons or depend totally on it in the classrooms. There are simply no adequate support programs in place for teachers. *"Teachers are intimidated. They have the knowledge and baggage but they are hesitant just because they don't feel they are supported enough while it is happening. We need to have someone in the school who can help them…teacher or research person or ICT person who is there at school that they can turn to if an iPad does not work…or kids cannot access X…this is lacking…. It is like when little children are learning how to ride their bike. There is someone behind them holding the seat. At some point, they let go of the bike but they are still behind. I think that is the support that is lacking for the teachers"*. Teachers mentioned that the classroom support they were getting was not enough. School consultants are usually very busy and diffused to schools an average of one day per week. For technical issues, such as sometimes some task that is as simple as a light bulb for the smartboard, teachers have to wait for days and sometimes even for weeks. They have to send emails to the school administration that in turn hands it to the technician. And then, the teacher has to wait. Teachers are not allowed to touch the equipment. They are not allowed to change a simple light bulb. They need to wait for the technician.

Need to incorporate technology in evaluations and curricular plans. Because curricular planning and student evaluations are closely intertwined, there is a necessity to reexamine the evaluation approaches when ICT is integrated into the pedagogical programs to take into consideration how the utilization of educational technology can meet the requirements of students' evaluations. Participants highlighted specific training needs as related to students' assessment when assessing ICT related outputs. Some teachers noted, *"Evaluations need to allow for technology integration as well"*. A teacher elaborated on this point, saying: *"How you evaluate digital work and how you integrate technology evaluation in your work can skew how learning goes up. I know that it does, but it does not show necessarily in everyone's classes."* Others mentioned that ICT objectives need to be integrated in the curriculum plan. Currently, ICT objectives are getting lost (falling into a grey zone area) because the focus is on the content instead of the process. Another teacher noted, *"If you are a creative teacher, you can sneak it, in whichever way you can. We have done a lot of professional development sessions this year on it, but a lot of teachers keep on saying, but how do I integrate it in my class?"*.

DISCUSSION AND CONCLUSION

ICT integration in education can enrich teaching and learning processes in numerous ways. That being said, the value of ICT integration in educational settings depends on the goals it serves and how well it is used by the teachers and students in the classroom. The fundamental theme underlying all results is that while ICT in education has great potential to enhance teaching and learning processes, turning that into reality is a complex and multifaceted job. To integrate ICT properly in k-12 education, long-term, carefully devised plans are required for meaningful changes to occur whether at the level of instruction, curriculum or simply classroom management. These changes cannot be changed after a couple of training sessions. Change is noticed gradually, over a number of academic years and necessitates significant professional development and ample support for stakeholders to progress from stage to stage.

According to the participants, the main benefits of ICT integration are higher student engagement levels and enhancement of the learning process. These results resonate with the recent study by Karsenti and Collin (2012). Their survey of 2,712 students from grades 3 to 11 and 389 teachers regarding their perceptions of the use of laptops in elementary and secondary schools in Québec English Schools shows that the perceived use of available laptops appears to be particularly conducive to student learning. The authors list a higher student engagement ratio as one of the main benefits, immediate access to a plethora of information and resources, in addition to students benefiting from additional time needed to practice challenging notions and increase self-competence levels.

As for the significance of ICT to special needs students, LEARN, Québec[2] highlights that there is no argument that ICT has a positive effect on the academic achievement of special needs pupils. The assistive technology signifies equality of opportunity for the special needs student. It is viewed as a tool that successfully supports the academic success of the student with learning difficulties and helps the student attain certain competencies, in addition to being more engaged in the classroom (retrieved from *http://learnQuébec.ca/en/content/pedagogy/insight/intech/assistive_technology/index*).

According to the participants, the complexity of integrating technology in educational settings is contingent upon a supporting school leadership. The presence of a school leader who knows about educational technology and whose goal is to integrate ICT in the school is a necessity to gear ‘the ship’ in the right direction. Means and Olson (1997) thus advise educationalists to have a clear vision before investing and spending money. In addition, this vision should not be a solid hand press from top to bottom. It should go in many directions with various stakeholders involved in building the vision, including teachers, board members and IT consultants (Costello, 1997). Ertmer (1999) claims: "A vision gives us a place to start, a goal to reach for, as well as, a guidepost along the way” (p. 54).

Previous research done by Anderson et al. (1998), Cuban (2001), Cuban et al. (2001), Ertmer (1999), Schoep (2004) and Vaughan (2002) indicate that investments in schools consisting solely of buying technological tools are not enough. Budgets for ICT investment should include equipment, resources, and software, as well as developing the infrastructure, updating and upgrading the latter regularly. Therefore, the budget for ICT integration in an educational institution should translate into consistent investments that include equipment, infrastructure and support services.

According to Papert, when technology enters classrooms, it "weaves itself into the learning process in many more ways than its original promoters could possibly have anticipated” (Papert, 1993, p.53). The trainings offered need to be delivered by qualified educational technologists and are not geared towards teaching them about the technology alone. Teachers need more than professional development workshops to help them utilize these technologies in the classrooms. They also need to take into account research that demonstrates the value of incorporating a variety of technologies into learning environments and how these tools can be incorporated creatively and effectively into instruction. If educators do not buy into the pedagogical value of various technologies, they will remain just fashionable add-ons in our curricula. Salomon (1993, p.189) claims: “No tool is good or bad in itself; [technology’s] effectiveness results from and contributes to the whole configuration of events, activities, contents, and interpersonal processes taking place in the context in which it is being used.” In light if this, if teachers or pedagogists do not change in the activities, curriculum and learning environment, it will stay un-integrated because of pedagogical constraints (Salomon, 1993).

---

2 *LEARN, Québec is a non-profit educational foundation funded by Québec-Canada Entente for Minority Language Education that offers English Québec school boards educational technology support and e-learning services.*

Anderson and Dexter (2003) have narrated several examples of how educational institutions can incorporate ICT in curriculum programs and students' evaluation plans. Teachers can do it gradually by investing a lot of time, careful planning and collective effort. For example, the school can manage to integrate project-based learning as a form of students' output and find ways to evaluate the work even if the students use computer laptops. Dexter and Anderson (2002) report that once this planning phase is completed, technology can be used more, students' engagement will be higher and the school will certainly feel an improvement in student achievement outcomes because individualized learning and interest levels of the students will be much higher. As for classroom support, whether pedagogical or technical, schools could collaborate with other post-secondary institutions like colleges or universities in order to have access to staff that cannot be recruited full time. These collaborations could result in (further) training, pedagogical integrations and technical support.

Last but not least, I believe the chief benefit English school boards can stand to benefit by is informally cooperating and coordinating amongst each other. Networking among English school boards could be very beneficial especially as it relates to joint support mechanisms as well as problem solving opportunities.

I end this study with a recommendation that resonated with me from the latest Advisory Board on English Education report (ABEE, 2013): "The Advisory Board respectfully asks the Minister to ensure the involvement of the Assistant Deputy Minister and his office in the development of policy and to provide them with flexibility in the application of policy and resource management." (p.30). The contextual particularities make it hard to develop and abide by a generalizable ICT funding policy for the English schooling sector. ICT integration in the English sector needs different levels of investments. The English school boards differ from each other with regards to size, geographical area and population nature/number. School boards cannot abide by a generalized ministerial funding policy. They simply have different needs that necessitate different investments.

FUTURE RESEARCH

This study is limited to a number of teachers and consultants per school board chosen by their corresponding Director General. In addition, it is also limited to one data collection technique. Future research should target a larger number of participants that is also more diversified with data collected from several sources including in-depth interviews to gain a comprehensive perspective of stakeholders' perceptions as it relates to ICT integration in Québec English school settings.

REFERENCES

Advisory Board on English Education (ABEE) (2013). *One size does not fit all.* Report to the Minister of Education. Montréal: Ministère de l'Éducation, du Loisir et du Sport.

Anderson, R. E., & Dexter, S.L. (2000). *School Technology Leadership: Incidence and Impact.* Teaching, Learning, and Computing: National Survey Report#6. Irvine, CA: Center for Research on Information Technology and Organizations, University of California, Irvine.

Anderson, R. E. & Dexter, S. (2003). *Newsome Park Elementary: Making learning meaningful through project-based learning using wireless laptops in a K-5 Math, Science, and Technology magnet school*. Case report from the U.S.A. Exemplary Technology-Supported Schooling Case Studies Project.

Anderson, T., Varnhagen, S., & Campbell, K. (1998). Faculty adoption of teaching and learning technologies: Contrasting earlier adopters and mainstream faculty. *The Canadian Journal of Higher Education*, 28*(2),* 71-98.

British Educational Communications and Technology Agency (BECTA) (2004). *A review of the research literature on barriers to the uptake of ICT by teachers.* Coventry: BECTA.

Costello, R. W. (1997). *The leadership role in making the technology connection. The Journal*, 25*(4),* 58-62.

Cuban, L. (2001) *Oversold and Underused: Computers in the Classroom.* Cambridge MA: Harvard University Press.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technology in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38*(4),* 813–834.

Dexter, S. & Anderson, R. E. (2002). *USA: A model of implementation effectiveness*. Retrieved from http://edtechcases.info/papers/multicase_implementation.htm.

Ertmer, P. A. (1999). Addressing First- and Second-Order Barriers to Change: Strategies for Technology Integration. *Educational Technology Research and Development*, 47*(4),* 47-61.

Ertmer, P. A., Addison, P., Lane, M., Ross, E. & Woods, D. (1999). Examining teacher beliefs about the role of technology in the elementary classroom. *Journal of Research on Computing in Education*, 32*(1),* 54–72.

Glaser, B. & Strauss, A. (1967). *The Discovery of Grounded Theory*. New York: Alpine.

Glaser, B. (1978). *Advances in the Methodology of Grounded Theory: Theoretical Sensitivity*. Berkeley, CA: University of California.

Glaser, B. (1992). *Emergence vs. Forcing: Basics of Grounded Theory Analysis*. Mill Valley, CA: Sociology

Press.
Hew, K. & Brush, T. (2007). Integrating technology into k-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology, Research and Development,* 55*(3),* 223–252.
Karsenti, T., Collin, S., Dupuis, A., Villeneuve, S., Dumouchel, G. & Robin, J.P. (2012). *Avantages et défis inhérents à l'usage des ordinateurs au primaire et au secondaire: 2e enque te auprès de la Commission scolaire Eastern Townships.* Synthèse des principaux résultats. Retrieved from: http://etsb.crifpe.ca/files/synthese_fre.pdf
Lim, C. P. (2002). A theoretical framework for the study of ICT in schools: A proposal. *British Journal of Educational Technology,* 33*(4),* 411- 421.
Means, B., Olson, K. (1997). *Technology and Education Reform: Studies of Education Reform*. Washington, DC: U.S. Government Printing Office.
Papert, S. (1993). *The Children's Machine*. New York: Basic Books.
Puentedura, R. (2006). *Transformation, Technology, and Education*. Presentation given August 18, 2006 as part of the Strengthening Your District Through Technology workshops, Maine, US. Retrieved from http://hippasus.com/resources/tte/part1.html.
Rabah, J. (*in press*). *A Holistic Approach to Technology Integration in Education.* Submitted as paper proceedings to International Conference on Education, Dubai, UAE, March 2015.
Salomon, G. (1993). No distribution without individuals' cognition. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp. 111-138). New York: Cambridge University Press.
Schoep, K. W. (2004). *Technology integration barriers in a technology-rich environment: A CBAM perspective*. Unpublished Master's thesis, University of Calgary, Alberta.
Tondeur, J., Devos, G., van Houtte, M., van Braak, J. & Valcke, M. (2009). Understanding Structural and Cultural School Characteristics in Relation to Educational Change: the case of ICT integration. *Educational Studies, 35,* 223-235.
Vaughan, W. (2002). Professional development and the adoption and implementation of new innovations: Do teacher concerns matter? *International Electronic Journal For Leadership in Learning*, 6*(5).*
Webster, F. (2005) Making sense of the information age. *Information, Communication & Society*, 8*(4),* 439-458.

Appendix A

Focus Group Questions

If you had to define ICT integration in your school/school board, what would you say? What technologies come to mind?

In your opinion, how well does your respective school/school board integrate ICT? How do you feel about that?

What do you think about student's academic performance and ICT integration? How do you see the two connected? Please explain.

Do you think ICT affect your students the same way (boys vs. girls, low SES vs. high SES; minority learners, students with special needs, as well as other possible digital divides)?

Do students generally have access to all the ICT tools they need to complete their schoolwork? How do you feel about that? How does it affect your teaching?

Do your students ever teach you new ways to use certain technologies or the impact a new technology can have? Do you ever involve your students to help you in developing new ways to incorporate technology into the classroom?

Talk about the support your school system provides for the integration of ICTs in classrooms such as professional development and pedagogical support.

What initiative(s) are put in place by the school system for technical support (such as technology personnel/ IT division) needed for teachers to integrate ICT in their classrooms?

Do your students have the necessary skills to manipulate and benefit from using different ICTs in pedagogical contexts? If not, who teaches them those skills?

What/who influences your decision to integrate (or not) ICT in your lesson plan or classroom?

Do you have a Facebook or Twitter account?

Do you talk to other teachers or do you discuss your experiences and communicate and/or collaborate with one another, outside of classroom time (e.g. email, Facebook, Twitter, etc.)? What issues do you usually collaborate/talk about?

Is there anything we haven't asked that we should have asked, and that you would like to talk about?

Cognitive Awareness Prototype Development on User Interface Design

D'oria Islamiah Rosli
Universiti Tun Hussein Onn Malaysia
doriaislamiah@gmail.com

ABSTRACT
Human error is a crucial problem in manufacturing industries. Due to the misinterpretation of information on interface system design, accidents or death may occur at workplace. Lack of human cognition criteria in interface system design is also one of the contributions to the failure in using the system effectively. Therefore, this paper describes stages of evaluation process on powder handling system prototype. In the study, the prototype was evaluated based on cognitive awareness criteria for interface system design: perception, comprehension, and projection. Five experts with more than five years of experience from engineering and information technology fields were involved in the evaluation process. Results in this study are essential to the researcher in order to improve powder handling system prototype. It is hoped that mapping up the cognitive awareness criteria in interface system design will help users to make better decisions while handling the system at the workplace.

INTRODUCTION
Accidents could happen at workplace without warning. This is due to human limitations in handling certain tasks that are beyond their control and expectations. In addition, lack of information while using the system is one of the results in human error. There are two types of accident implications: permanent disabilities and death. Thus, accidents cause a great lost of expertise, time, and money especially for the family, organisation, and community as whole. After the World War II, demands for research on complex technical system have increased rapidly. Researchers and engineers have started to develop an automated system and focus more on system functions without knowing that too many automatic functions embedded on the system cause difficulties for human to control the system (Hollnagel and Woods, 2005).

Then, the research continues on investigating tasks that can be done automatically by a system and tasks that can be controlled by human. In relation to this, technology system becomes more complex in order to accommodate the role of human as the main user of the system. The ease of use of a system is needed in order to support learnability process among users. Ability to understand the system will help users to minimise human error. In fact, in line with cognitive research, there is still limited number of researches that focus on interface system design as a mediator in system interaction. Therefore, the role of interface system design is crucial in providing input for users to make correct judgments in handling the system.

Hence, this study was conducted with the goal to improve system prototype that included human cognitive criteria into interface system design. The prototype was developed in stages and the prototype was improved as the evaluation got along. Five experts were involved in the participatory design process starting from the prototype sketching until the final powder handling failure configuration functions. In addition, five evaluators were sufficient for the discovery of about 75% of the overall system evaluation problems and it was possible to achieve substantially better performance by aggregating problems from several evaluators (Preece et. al, 1994). Results from this study were crucial in order to improve the powder handling simulation system in accordance to increased human awareness in handling the system effectively.

Cognitive Model
Classic human cognitive model is also known as Human Information Processing System. The model explains how human receives the information from sensory input and transfers it to the brain. The brain will then make an interpretation and human will perform an action upon it.

To make an interpretation, firstly the information from sensory inputs such as visual and auditory information will be sent to human working memory. At this stage, if the information is activated by the user regularly, the information will be sent to human long term memory. Information stored in long term memory will decay if the information remains passive (Friedemberg and Silverman, 2015). To help users to retain their knowledge on a particular system, system designers should consider ways to help the users to make use of their knowledge stored in the long term memory.

Interface system design plays an important role to trigger human long term memory because via interface design, user will be able to recognise the information that they used before (Thimbleby, 1998). For that reason, one of the solutions is to incorporate the cognitive model into the interface system design. This solution will help users to use the system in an effective way.

Interface design, as an intermediary between users and system plays, an important role for a system. Users will perceive information from the interface and interpret the information into meaningful information. Users then will act towards related information that is stored in their memory. Sequentially, it is important to include cognitive criteria on interface system design because any wrong information conveyed to users via interface system design may lead to hazardous condition. Thus, in this study, our aim was to enhance human decision making by integrating the cognitive criteria in interface system design.

Situational Awareness (SA) is commonly defined as perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future (Endsley, 1995). In order to make a wise decision in handling a system, the role of SA in interface system design is to provide useable cognitive information for users. In other words, users need to understand available information around them because if any unexpected incident happens, users are ready to give immediate response.

Furthermore, recognition-primed decision making research explains that pattern recognition is important in decision making (Klein, 1989). Human will select the best alternatives from pattern recognition process rather than comparing other alternatives in order to select ultimate solution (Figure 1). For that reason, system designers need to consider complementing users' cognitive requirements in interface system design. Additionally, there is interconnected relationship between SA and decision making; if SA is activated, then decision making is also activated, and vice versa (Adams, Tenney and Pew, 1995).

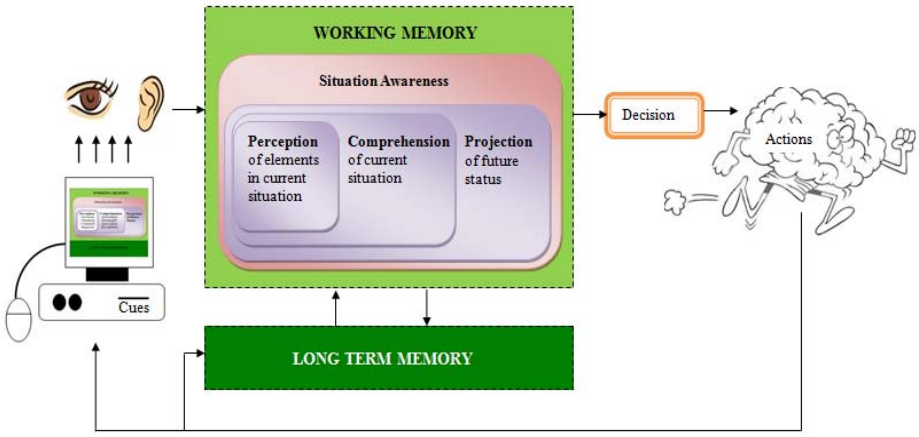


Figure. 1. Cognitive Awareness Model for interface system design.

Theory Mapping

Enhancing the prototype interface system design is crucial in mapping up cognitive awareness theory into the system design process. In this study, cognitive criteria that will be incorporated in this powder handling system were identified through several analyses that we had done earlier (Rosli, 2010; 2011; 2012). Then, the cognitive criteria were categorised based on the three levels of SA: perception, comprehension, and projection. Next, as shown in Figure 2, the cognitive criteria were mapped up in the powder handling simulation system prototype.

Perception

Users perceive useful information from cues in the environment. Stored knowledge in users' long term memory helps them to classify perceived information into meaningful representations. This information is structured in accordance with situated time and space. The information is also known as attention-based selection on task requirements (Endsley, 1995). Perceived information that matches with the stored information is ready to be retrieved by users as a basis for user awareness.

Affordance is the design aspect of an object that suggests how the object should be used (McGrenere and Ho, 2000). In other words, affordance provides strong clues to the operation of things. For example, buttons with two

layer images (Figure 2) usually give hints to user that the buttons are active and the user can click on the buttons. Additionally, by integrating affordances into the interface system design, the user knows what to do by just looking at the design, thus instructions, label or pictures are not required (McGrenere and Ho, 2000).

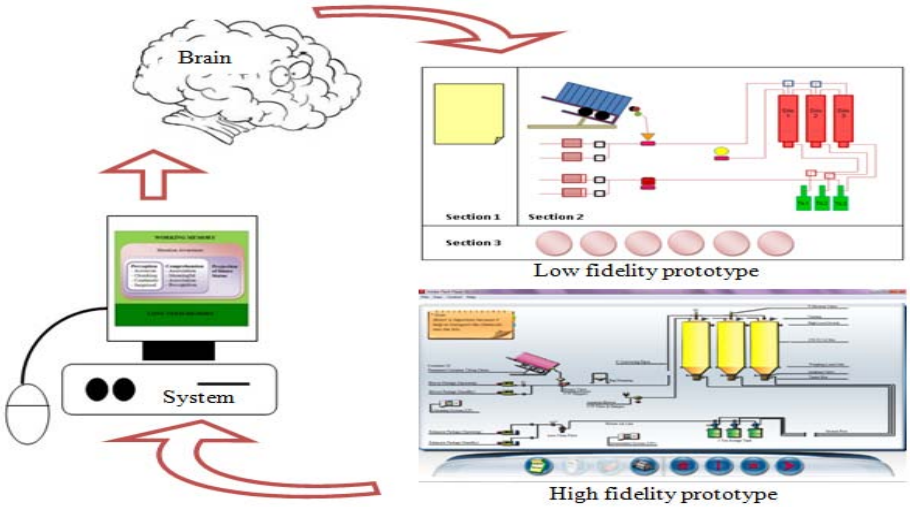


Figure. 2. Cognitive awareness model mapped with interface system design prototype.

Furthermore, chunking was also used as a technique to combine many units of information into a limited number of units or chunks. According to Miller's magic number, human can process information in 7±2 items or chunks at one time (Banbury and Tremblay, 2004). Thus, short and simple instructions incorporated in the interface system design are easy to process and comprehend by users. Chunking information will help users to increase their recall performance because structured information is easy to retrieve from their long-term memory. Additionally, chunking is used when people are required to recall and retain information. In contrast, chunking is not applicable for applications that require searching and scanning information functions.

Moreover, Gestalt design principles were also used to group buttons with similar functions. For example, the navigation buttons are grouped together at the bottom right of the screen, and buttons that represent system failure are failed are on the bottom left (Figure 2). Similarities state that things sharing visual characteristics such as shape, size, and colour will be perceived as a part of the same form. The eye will easily spot on sections for similar functions in order to avoid confusion (Wickens et. al, 2004).

In addition, to support human mental model in perceiving information in the environment, familiarity, visibility, and consistent images and icons will improve the recognition of information that is useful, and help users to understand the system. For instance, images that represent an action of an object or concept are meaningful to users and require less time to learn. Moreover, this will reduce users' mental workload and due to that, users will be able to focus on more critical tasks (Shneiderman and Plaisant, 2010).

Comprehension

At the comprehension level, users will organize and understand the significance of perceived information on a particular situation. Moreover, with meaningful interpretation, users will be able to have a mental model about the situation stored in their long term memory. At this level, SA is defined as a situational model depicting the current state of the mental model (Endsley, 1995).

In this study, to help users to comprehend information from a system, association cognitive criteria were incorporated in the prototype design. For instance, classical conditioning technique was used to associate a stimulus with an unconscious physical response (Sobel, 2001). In other words, this technique was to influence the appeal of a design with a trigger stimulus, which would evoke an unconscious response. For example, in the prototype system design, a blinking red and yellow animated image with high pitch alarm would attract users' attention. In addition, salient cues used in prototype design made the signal visible and noticeable by users (Dix et. al, 2004).

Moreover, to aid users with better understanding in handling the system, information displayed on the interface system design needs to be semantically associated together. For example, in the prototype system simulation in this study, if the user clicked the "play" button, the powder will be transferred from the container to Silo tanks.

An indicator will move up from its original position to show that the powder was filled up into the Silo tank. Once the Silo tank was full, the tank will change colour to inform users that the tank had been loaded with powder chemical. The same general concept applies when we fill up a bottle with water. By including general and informative information in the design, it is hoped that users will be able to enhance their learnability process in using the system.

Projection

At the final stage of SA, projection is achieved via knowledge of the status and the dynamics of the elements and comprehension of the situation (Endsley, 1995). The mental model helps users to understand the situation and allows them to generate probable solutions to deal with future states of the system.

Feedback projection criteria included in system design is important to guide people in using the system. Feedback is crucial as the system will send back information about the next actions that users they need to take. For example, in system design, feedback can be observed visually or auditorily. Furthermore, to include feedback cognitive criteria in interface system design, feedback should provide direct and simple feedback that users can understand.

Additionally, pop out messages and signal display incorporated in the system will help users to make a wise prediction on actions that they need to take. Therefore, it is important to design a system that is meaningful so that users will understand the overall concept of the system that they use in their daily working tasks. For that reason, in this study, we included three common problems in system maintenance, which are motor, cable position, and driver failure problems. In relation to this, short messages on system failure configuration solutions will be displayed upon request by users. Therefore, it is hoped that by mapping up the cognitive criteria in the interface system design will help users to understand and perform well while interacting with the system..

Prototype Development

Prototype evaluation process is essential to seek comments or ideas in improving the final outcome of a system. The activity done in developing a prototype encourages reflection in design (Schon, 1983). In fact, the activity is an important feature in design process. The aim of having a prototype evaluation is to move through diverse design ideas until the idea that meets user requirements has finally been identified.

In this study, the prototype evaluation ran in stages. The four basic steps were designing, developing, testing, and analysing. For each stage of the prototype evaluation process, participants were asked to explore the prototype. No specific time was allocated for them to explore the prototype. Once they were satisfied with the prototype, they were then to answer the prototype checklist given to them. Then, feedback from the participants were collected and analysed in order to retrieve ideas to improve the system design. Next, the suggestions were incorporated into the next stage of prototype development process. This process was complete when all of the system requirements were fulfilled.

The evaluation began from low fidelity prototype to high fidelity prototype. For instance, in this study, the low fidelity prototype included prototype storyboards of the interface system design. In fact, the low fidelity prototype storyboards consisted of a graphical representation of the real system design without any actual system functioning (Dix et. al, 2004). Since the low fidelity prototype highlighted only the layout of the system, the prototype checklist given to them only covered the cognitive awareness perception criteria (Table 1). In contrast with high fidelity prototype, the prototype included interactive screens with the final interface system design. At this stage, the prototype checklist given to the participants consisted of cognitive criteria literally related to perception, comprehension, and projection.

Table 1: Stages of prototype evaluation process.

Prototype	**Cognitive Awareness Criteria**
Low fidelity prototype 1	Perception
Low fidelity prototype 2	Perception
High fidelity prototype 3	Perception, Projection, Comprehension
High fidelity prototype 4	Perception, Projection, Comprehension
High fidelity prototype 5	Perception, Projection, Comprehension

Participatory Design Evaluation Process

Participatory design is an evaluation design that covers overall prototype development process. Participants whom are usually experts in the work context are encouraged to be actively involved in the design process in order to improve the system design. In this study, participatory design was employed for a few reasons. First, the

participatory design allowed the participants to contribute directly in the system development stages. Second, the participatory design was able to enhance the interaction between the system and working environment. Third, the participatory design was used to evaluate and refine the system design at each prototype development stage.

In this study, five experts from Engineering and Information Technology (IT) background were involved in improving the prototype interface system design. At this stage, two engineering experts who had experience in system maintenance contributed in improving the interface and functions of the system and the other three experts were from the Technical Education and IT field who concentrated on the interface and interaction of the prototype. To gather ideas and comments from the participants, a prototype checklist was given to each of them. There was no restriction of time for them to complete the prototype checklist, but they were given at least 2 weeks to evaluate the prototype. Then, the checklist was collected from the participants for further analysis.

Table 2: Participants' background

Participant	**Designation**	**Years of service**	**Expert's role**
P1	Instrumentation Engineer	>10 years	Interface and system functions
P2	Maintenance Engineer	>5 years	Interface and system functions
P3	Technical Education Instructor	>5 years	Interface and interaction
P5	IT Instructor	>10 years	Interface and interaction
P6	IT Instructor	>10 years	Interface and interaction

The prototype checklist used in this prototype evaluation process consisted of a checklist and open-ended questions. During the evaluation process, participants were encouraged to give comments and ideas related to the prototype interface system design. Participants were also free to ask questions to the researcher should they required further explanation about the system or any other problems that they encountered during the evaluation process.

The prototype checklist used in this study consisted of three levels of interface design cognitive awareness criteria, which were analysed from researcher's related studies. Most of the criteria were analysed from cognitive theories, interface design principles, interaction design, cognitive method studies, and ISO system design principles (Rosli, 2012).

FINDINGS AND DISCUSSION

Comments and ideas from the participants were essential at this stage to improve the final prototype interface system design. One of the challenges in participatory design in prototype evaluation process was time constraint. Generally, it took more than six months for the researcher to develop the prototype, to seek feedback from experts, and to improve the prototype until the experts were satisfied with the prototype. Findings from each level of the prototype were organised in a table form Feedbacks from the participants are discussed in the following sections.

Findings on Perception

At each stage of the prototype evaluation process, the prototype was improved based on inputs from the participants. In relation to visibility criteria, almost all the participants understood the information displayed on the system at all stages of the prototypes (Figure 3). For example, three basic saturated colours were used in the prototype design due to the fact that saturated colours were able to attract user attention. Even to date red and yellow colours are used for alarm signal because they resemble alarm signal in normal daily life. The red-coloured signal represents danger while yellow-coloured signal alerts people to always get ready for any circumstances that could occur. Moreover, red is commonly used to show danger signal because the colour has the longest wavelength and therefore it can be seen from afar (Forsyth and Ponce, 2011).

Next, similar to visibility cognitive criteria, almost all of the participants were familiar with the functions of powder handling system. For instance, they knew that the system begins with first stage of low fidelity prototype and ends with final stage of high fidelity prototype. However, three participants claimed that the system design should help them to recall any knowledge about system technology that has been stored in their long term memory. Two participants highlighted that, indication signal showing the Silo tank was filled with powder was rather small. In order to improve the design, the size of the indicator should be bigger. Besides, the participants also suggested for the Silo tank to be changed to other colour to indicate that the Silo tank was full with the

chemical. As a matter of fact, visible information is vital in interface system design as it helps users to recall information that they have experienced before (Chance, 2008).

Moreover, for chunking, consistency, and affordance criteria, almost all the participants reported that the cognitive criteria were properly integrated in the system starting from prototype stage four. Therefore, focus should be given to these three criteria in order to design a system that could help to enhance human performance. Instructions and solutions should be designed in short and simple words so that designer can chunk the words, highlight important words, and bold or colour the text. If the sentences are too long, designer can use bulleted form or break the sentences into shorter sentences. On top of that, less time will be used by users to find useful information while interacting with the system.

As for affordance criteria, system designer can design the button with big to small or bright to dim button style if their concern is it to attract user attention in using the system. In the study, the participants also claimed that the prototype was yet to be consistent after stage three because only one or two buttons were linked to the correct page. It is important that to retain users' interest to the system, thus the system should be free from broken linkages. Other than that, the participants also stated that it was not necessary to arrange the buttons according to frequency of use, i.e., most frequently used button is at the bottom right corner while the least used button is on the left.

Next, in terms of system prototype layout, the participants were satisfied with the system layout as the simulation area was designed in the middle of the system's screen and the buttons were arranged at the bottom. In point of fact, users will be more focused on the simulation if it is in line with human focal point (Wickens et. al, 2004).

Prototype	I					II					III					IV					V				
Characteristic	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5
Affordances	-	0	-	-	-	0	0	-	-	-	0	0	0	-	-	1	1	1	1	1	1	1	1	1	1
Chunking	0	-	0	-	-	1	-	0	-	-	1	-	1	-	1	1	-	1	1	1	1	-	1	1	1
Consistency	0	1	-	-	-	0	-	-	-	-	0	1	-	0	-	1	1	1	1	1	1	1	1	1	1
Familiarity	-	0	1	1	0	1	1	1	1	0	1	1	1	-	0	1	1	1	1	1	1	1	1	1	1
Recognizability	-	-	-	0	-	-	0	0	1	0	1	-	1	-	1	1	-	1	1	1	1	-	1	1	1
Visibility	-	-	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1
*Note	"-" No feedback					"0" Disagree										"1" Agree									

Figure. 3. Perception design criteria.

Findings on Comprehension

Comprehension and projection criteria were only evaluated by the participants starting from high fidelity prototype type because stage I and stage II of the prototype only concentrated on ways users perceived the system. Therefore, as shown in Figure 4, almost all the participants agreed that generalisation characteristic in comprehension criteria should be improved continuously until the final stage of prototype.

Prototype	I					II					III					IV					V				
Characteristic	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5
Association	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1	-	1	-	1	1	-	1	1	1
Generalisation	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1	1	-	1	1	1	1	-	1	1	1
Learnability	-	-	-	-	-	-	-	-	-	-	0	1	0	-	-	1	1	1	1	1	1	1	1	1	1
Informative	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0	1	-	1	-	-	1	-	1	1	1
*Note	"-" No feedback					"0" Disagree										"1" Agree									

Figure. 4. Comprehension design criteria.

A system that is easy to use should provide functions that are general so that the system is applicable for users of all levels such as the novice, intermediate, and expert users. For instance, options to display or hide labelling for the prototype system design is included in the prototype design. The system labelling is useful for the novice users. On the other hand, expert users will only retrieve the information if they find that the system labelling is needed. Moreover, it is important to design a system that fulfils user requirements, so that users will be able to

comprehend information conveyed to them via the interface system design.

The participants also agreed on the signals that used daily life routine in association with system design concept (Thimbleby, 1998). In conjunction with learnability and informative criteria, the participants seemed to understand the short notes provided at the top left corner of the systems. The short notes explained the impact if one of the system components broke down. The short notes also helped the participants to recall possible consequences that could happen to lead them think of the solutions to overcome any arising problems (Preece, Rogers and Sharp, 2006). To optimise safety at workplace, users will always be ready to face any hazardous situations as long as cues or information is visible and able to capture their attention. Thus, users can at least immediately think of the solutions to safe one's life.

Findings on Projection

It is a challenge to integrate projection design criteria in the prototype interface system design. This is because system designer needs to develop a system that can guide users to give positive response while using the system. In this study, the participants showed that an improvement was still needed even at the final stage of the prototype system evaluation to make sure that users can deal with the information conveyed to them accordingly (Figure 5).

Prototype	I					II					III					IV					V				
Characteristic	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5
Concept	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	-	1	1	1	1	1	1	1	1
Feedback	-	-	-	-	-	-	-	-	-	-	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1
Meaningful	-	-	-	-	-	-	-	-	-	-	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1
Prediction	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1	-	1	1	1	1	-	1	1	1
*Note	"-" No feedback					"0" Disagree										"1" Agree									

Figure. 5. Projection design criteria.

For instance, as reported by the participants, they found it hard to predict the type of system fault that could occur in the prototype. Participants suggested providing a short message informing users on types of system fault that could happen at any time. Providing such information will help the users to analyse the problems and for them to come up with possible solutions (Dix et. al, 2004).

In order to give meaningful simulation, two participants suggested that symbols or images used in the system design should use engineering standard symbols for system or machines in order to avoid confusion among users. Unambiguous symbols in the system will help users to have a clearer picture on how the system works (Norman, 1986).

Feedback, guidelines, solutions, short notes, and pop up messages will help users to have a quick analysis on the next actions that they need to take in dealing with the system. In this study, all the participants were satisfied with the concept of continuity embedded into the system. By highlighting important information at the earlier stage of the simulation process, it is able to attract user attention to the system. As people tend to lose focus at the end of a particular situation, important information should be highlighted at the earlier stage of system design (Chance, 2008).

Additionally, to represent similar meaning and command to user mental model, designer can combine the information in displaying warning to attract user's attention, integrate the information in designing signage, or incorporate the information in logo to make the identification process faster. As a whole, in this study, the participants showed rising growth of agreement towards the end of the final stage of prototype development process. The participants were able to use the system smoothly and the incorporated cognitive criteria helped them in handling the system..

CONCLUSIONS

This paper describes the importance of cognitive awareness criteria incorporated in the prototype interface system design. The prototype was evaluated in stages by the participants in order to enhance the interface system design. Ideas and comments from the participants were essential to the researcher as these ideas and comments were useful in improving the powder handling simulation system for further research analysis.

In general, it was rather a challenging task to incorporate the cognitive awareness criteria in the prototype system design. Progress in developing the prototype was expanding moderately and the prototype was improved after each stage of evaluation process. From the perception criteria feedback, three criteria that have to be given more time to design in designing a system were affordance, consistency, and visibility criteria. System users need information that is able to evoke their memory so that they can select and react accordingly while handling the system. Similar to consistency, it is important to keep the design consistent in order to avoid ambiguous feeling to users while they are interacting with the system.

As for comprehension criteria, a system that supports users' learnability process allows users to own the skills in controlling the system. If problems occur, they will be able to act automatically and think precisely on the actions that they need to take while handling the situations. It is a challenge to provide information that meets users' cognitive requirements. Therefore, active contributions from the participants in designing the system were essential to make sure that users' cognitive needs were incorporated in interface system design.

In order to help users to perform well in their decision making, system designer needs to focus more on ways to design feedback and meaningful projection criteria in system design. Due to human abstract thinking, system designer also needs to design a system that helps users to understand the system and situations around them. Appropriate and useful information are thus crucial to system users as the information will be observed and analysed by them in order to select the best actions while interacting with the system. It is hoped that cognitive criteria will help users to enhance their performance in using the system and help them to minimise human error at workplace.

REFERENCES

Hollnagel, E., & Woods, D. D. (2005). *Joint Cognitive Systems: Foundations of Cognitive Systems Engineering*. Boca Raton, FL: Taylor and Francis.

Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., & Carey, T. (1994). *Human Computer Interaction*. New York. Pearson Addison Wesley.

Friedemberg, J., & Silverman, G. (2012). *Cognitive Science and Introduction to the Study of Mind*. Thousand Oaks, CA: SAGE Publications.

Thimbleby, H. (1998). *User Interface Design*. New York: Addison Wesley.

Endsley, M. R. (1995). *Toward A Theory Of Situation Awareness In Dynamic Systems. Human Factors*, Vol. 37(1). (pp.32-64). IEEE Xplore.

Klein, G. A. (1989). Recognition Primed Decision. In W. B. Rouse (Ed), *Advances in Man Machine Systems Research*, Vol. 5. (pp.47-92).

Adams, M. J., Tenney, Y. J., Pew, R. W. (1995). *Situation Awareness and the Cognitive Management of Complex Systems*. Vol. 37. (pp85-104).

Rosli, D. I., Alias, R. A., & Rahman, A. A. (2010). Interaction Design Issues: A literature review. *Proceedings of 2010 Conference on User Science and Engineering (i-User)*. (pp.133-138). IEEE Xplore.

Rosli, D. I., Rahman, A. A., & Alias, R. A. (2011). Situational Awareness Needs for System Interaction Design. *Proceedings of 2011 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*. (pp.1888-1892). IEEE Xplore.

Rosli, D. I., Hassan, R., Rahman, A. A., & Alias, R. A. (2012). Technical System Interface Design: An Analysis on Human Cognitive Model. *8th International Conference on Information Science and Digital Content Technology (ICIDT)*. (pp. 82-87). IEEE Xplore.

McGrenere, J., & Ho, W. (2000). Affordances: Clarifying and Evolving a Concept. *Proceedings of Graphics. Interface 2000.* (pp.179-186).

Banbury, S., & Tremblay, S. (2004). *A Cognitive Approach to Situation Awareness Theory and Application*. Ashgate Publishing. Hampshire, England.

Wickens, C. D., Lee. J., Liu. Y., & Becker. S. G. (2004). *An Introduction to Human Factors Engineering*. New Jersey, Pearson Education Incorporation.

Shneiderman, B., & Plaisant, C. (2010). *Designing the User Interface: Strategies for Effective human Computer Interaction*. (5Eds). NY: Pearson Addison Wesley.

Sobel, C. P. (2001). *The Cognitive Science*. Mayfield Publishing Company. MV: California.

Dix, A., Finlay, A., Abowd, G. D., & Beale, R. (2004). *Human Computer Interaction*. (3 Eds). London: Pearson Prentice Hall. London.

Schon, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. New York: Harper Collins.

Forsyth, D. A., & Ponce, J. (2011). *Computer Vision: A Modern Approach*. 2 Eds. Prentice Hall.

Chance, P. (2008). *Learning and Behavior*. 6 Eds. CA: Wadsworth Belmont.

Thimbleby, H. (1998). *User Interface Design*. ACM Press. New York: Addison Wesley.

Preece, J., Rogers, Y., & Sharp, H. (2006). *Interaction Design Beyond Human Computer Interaction*. England: John Wiley and Sons.

Norman, D. A. (1986). *User Centered System Design: New Perspective on Human Computer Interaction*. Hillsdale: Lawrence Earlbaum.

Determination of Critical Success Factors Affecting Mobile Learning: A Meta-Analysis Approach

Muasaad Alrasheedi and Luiz Fernando Capretz
Department of Electrical and Computer Engineering, Western University, London, Ontario, Canada
{malrash, lcapretz}@uwo.ca

ABSTRACT
With rapid technological advancements, mobile learning (m-Learning) offers incredible opportunities, especially in the area of higher education. However, while interest in this area has been significant and several pilot studies have been conducted within universities, relatively less is known about how higher educational institutions can make efficient use of the m-Learning platform to support teaching and learning. Although there are numerous studies in the area, the lack of this insight is mostly due to the fact that very little effort has been made to collate these studies and determine a common set of key success factors that affect the acceptance of m-Learning within universities. This study conducts a systematic analysis of several studies conducted in the area of m-Learning to assess the critical success factors, by making use of the meta-analysis technique. Our investigation has shown that the most important perceived advantages of m-Learning, from learner perspectives, are collaboration during studies, the prospect of ubiquitous learning in space and time, and user friendly application design.

INTRODUCTION
The work described in this paper builds on previous work (Alrasheedi & Capretz, 2013a) carried out by the authors, which investigates the critical success factors (CSFs) affecting m-Learning platforms. The mobile phone industry has experienced the fastest rate of growth universally throughout the world. While the technology itself came into prominence in the 1980s, the use of the mobile phone was limited to only about 30% of the global population in 2004 (Paul & Seth, 2012). This figure has increased drastically, and, according to a World Bank estimative, more than 90% of the global population is within the range of a cell phone tower. The number of global subscribers have increased from fewer than 700 million in 2000 to more than five billion in 2010, which was about 70% of the population in this year (The World Bank Institute, 2012). The statistics not only point towards the immense success of the technology, but also highlight the versatility of the mobile phone. The rapid acceptance of the technology only serves to underscore the fact that people are aware of the multitude of benefits of the technology and are interested in using it in their daily lives. The continual addition of sophisticated features has only enhanced the usability of mobile phones in several different application areas.

With the rapid rate of advances in mobile phone technology, hi-tech capabilities are now on hand as educational aids and services for both learners (students) and educators. This has led to the growing prominence of m-Learning, with several pilot projects being set up in universities to demonstrate the technical feasibility and pedagogic possibility in the tertiary education section (Zeng & Luyegu, 2011). The reason for the specific interest in the use of m-Learning in higher education, specifically in the engineering and technology field, is because learners are considered to be sufficiently old and technically competent to understand and exploit the mobile phone interface for educational purposes. Further, most of the technical students in this age group already own mobile phones and thoroughly understand their use (Tsai et al., 2005). Studies have shown learners to be completely in favor of using m-Learning as a learning platform as they believe that this will enhance their educational experience. While there are certain concerns regarding the price of inclusion of the technology, most learners consider it to be a good idea. According to learners, the most attractive feature of m-Learning is the possibility of self-learning at their own pace, place, and time (Vate-U-Lan, 2008).

All these factors should mean that the rate of adoption of m-Learning platforms in universities should be at least on a scale similar to its overall growth. Statistics show that this is not the case. Campuses have been relatively slow to adopt m-Learning as a mainstream platform. For instance, the 2010 Campus Computing survey showed that only 13.1% of higher educational institutions have already developed or enabled m-Learning (Quinn, 2011). The discrepancy between distribution of mobile devices and their use in higher educational institutions is a very interesting and relevant one. The growing interest in the field has compelled many researchers to scientifically study the m-Learning phenomenon. Despite this, relatively little is known about the big picture of how universities can use mobile devices to support teaching and learning (Zeng & Luyegu, 2011). This is because most of the research in the area of m-Learning is highly subjective and contextual, tailored to the requirements of a specific educational institution. Additionally, the definitions used by researchers to describe what they mean by m-Learning are also different. This makes it difficult to collate various studies in the area of m-learning (V t j et al., 2009).

However, we contend that, despite the highly contextual nature of m-Learning studies, several characteristics are similar and the results could be developed into a framework for assessment of the success of m-Learning. One such framework was presented by Ali et al. (2012), where learning contexts, learning experiences, and design aspects were used to assess the success of m-Learning (Ali et al., 2012). Our research uses the meta-analysis approach to conduct a systematic literature review to determine the CSFs for the success of m-Learning in higher educational institutions.

The paper starts with an insight into the key benefits of m-Learning. This is followed by a brief discussion of the CSFs determined by an historical study. The next section discusses our methodology of meta-analysis to determine the CSFs based on recent studies. This is followed by a discussion of the results of the meta-analysis. The paper concludes with a summary of the conclusions and future implications of this study.

MOBILE LEARNING

The unique feature of the m-Learning platform that makes it a new educational platform is mobility. The concept of mobility refers to the prospect of having flexibility in terms of time, place, pace, and space that cannot be achieved when using non-mobile versions of devices (Andrews et al., 2010). In theory, m-Learning offers learners the opportunity of learning anytime and everywhere. However, it must be understood that the terms 'anytime and everywhere' are limited from being universally true due to connectivity as well as safety restrictions (Saccol et al., 2010).

Mobility is, however, not the only advantage users receive. A key benefit offered by the m-Learning concept is the feature of collaborative learning. While collaboration is also a part of education in traditional learning scenarios, the use of mobile devices means that learners can now interact with fellow students and educators from different locations even when they are not in a formal classroom. Mobility combined with collaborative learning makes the m-Learning platform different from any other existing learning platform, whether it is traditional face-to-face learning or other technology-based platforms like e-Learning (Kukulska-Hulme & Taxler, 2007).

The mobility feature of the m-Learning platform has several implications and applications. It allows learners to manage the content, scope, and space of their learning. Learners also have control over the time and place where they access learning materials. Professionals use this feature of m-Learning for just-in-time learning. This means that employees learn a particular concept as and when they require it and apply it immediately after learning, instead of following the traditional learning process where they learn at a workshop, store this knowledge in their minds, and then use this information practically at a later date. Last, but certainly not least, the mobility feature allows learners from geographically remote locations to be included as a part of the mainstream educational process, without having to shift their location (Saccol et al., 2010). Thus, the concept of mobility is not limited to students being mobile, but the instructors and learning content are also not tied to a particular location. The mobility of learning content can also be translated into a reduction in processing time and a lack of boundaries to physical access. As can be seen, the mobility of learning content is truly revolutionary and pushes the envelope in the context of learning mechanisms as well as information access (Moura & Carvalho, 2010).
However, despite the increase in mobile usage, especially among college-going students, and the multitude of benefits the platform offers, its adoption into mainstream education has been slow. Many analysts attribute this anomaly to a lack of understanding by educators of how to use the technology to enhance the learning process. University management is also said to be extremely conservative and is reluctant to make large investments and revolutionize their tried and tested mode of imparting education. Not many are impressed even by the documented proof from various research studies showing positive inputs from students and other educators regarding the use of m-Learning. University management is also apprehensive of the impact of rapidly changing technology as well as the issues of security and privacy (Wilen-Daungenti, 2008).

It can be seen that instead of presenting multiple research reports from different universities, a common framework of assessment would be of more interest to university management. This framework can be used to assess the barriers to m-Learning within their own educational institution and the progress can be reviewed periodically to assess its success. Needless to say, the development of such a framework requires a comprehensive knowledge of the critical parameters that affect m-Learning. The present paper is an attempt to collate multiple research studies to arrive at these CSFs.

CRITICAL SUCCESS FACTORS OF M-LEARNING (REVIEW OF PREVIOUS STUDIES)

The m-Learning platform has changed the learning paradigm, and it has the potential to alter the way education is imparted. Most of the pilot studies reviewing the adoption and success of m-Learning within universities tend to focus only on the technical capabilities. As m-Learning technology is entirely dependent on the interaction

between humans and machines, focusing solely on the capability of mobile devices and applications only limits the picture. The perspective of success factors must also extend to the usage of m-Learning in different contexts in addition to user experiences from the points of view of learners, educators, and university management (Andrews et al., 2010).

While several researchers have conducted a study of m-Learning projects for determining CSFs, very little effort has actually been put into collating these studies and coming up with a common set of success factors. Cochrane and Bateman (2010a) are responsible for a handful of recent studies involving a cumulative assessment of CSFs from multiple m-Learning studies. They examined 12 m-Learning intervention studies conducted between 2006 and 2009 and pointed towards a single CSF – pedagogical integration of technology into course criteria and assessment. The researchers agreed that there were several other success factors, though they do not measure the extent to which each factor influences the success of m-Learning in the tertiary education sector (Cochrane Bateman, 2010b). This 2010 study was further limited because, while the individual studies considered m-Learning in a different context, they were limited to the use of mobile web 2.0 in tertiary education (Cochrane, 2010). Cochrane's study also addressed the CSFs but this time the study was limited to the analysis of the application of mobile web 2.0 in tertiary education (Cochrane, 2014).

Another study that evaluated the CSFs for m-Learning was published in 2006. This study was conducted by Naismith and Corlett (2006) and involved an exhaustive study of the literature pertaining to m-Learning, published at various m-Learning conferences between 2002 and 2005 (Naismith & Corlett, 2006). The researchers found that while other studies have found a wide array of factors responsible for the success or failure of m-Learning projects, five of the factors were a part of every m-Learning literature – technology availability, support of the concerned institution, network connectivity, assimilation with study curriculum, student experience, or real life, and technology ownership by learners (Adeyeye et al., 2013).

While the study is detailed in its analysis it has the following two drawbacks that prevent it from being relevant in the present-day context. First, the study itself is more than six years old. As previously discussed, during this period the penetration rates of mobile phones have exploded. People all over the globe, including from remote areas and communities, now have access to mobile phones. Mobile phone features have also become extremely sophisticated during this period, especially with the introduction of the Apple iPhone series and all different brands that offer touch screen smartphones. People are also getting used to the rapid technology advancement in mobile phone technology and a large proportion have already jumped onto the smartphone bandwagon. This means that there is a critical need to re-evaluate the CSFs in light of the present state of adoption of mobile technology among the general population. Furthermore, with each new development in technology there are several other new factors which can influence a person in making personal choices, especially when doing so affects other people (Capuruço Capretz, 2010). The previous study also has another drawback. While the study itself uses information from multiple research studies conducted during a three-year period, it does not make use of any systematic method for analysis nor does it measure the extent to which each factor influences the success of m-Learning in tertiary education. The present study attempts to overcome these drawbacks.

Another recent effort made to determine the CSFs of m-Learning was made by UNESCO. A recent report by UNESCO on m-Learning considers the following factors as essential conditions for successful adoption of m-Learning: affordability, leadership, content, support from educators and parents, well-defined m-learning goals, recognition of informal learning, and defined target learner groups for m-Learning (UNESCO, 2011). Interestingly, the UNESCO study also argues that the specific set of CSFs changes as does the learning environment. The study, while giving valuable insights, is not highly relevant to the present context. As UNESCO says, the success factors change as per context, and their report has considered m-Learning in general – including within schools and universities (UNESCO, 2011). The present study addresses the issue of factors of m-Learning in higher education. At this level, the issues of privacy, responsible use of mobile devices, and technical competence and maturity of students are higher than lower-level students. Hence, the m-Learning context and application design is entirely different. Further, the study is limited to different countries in Asia and Africa (UNESCO, 2011), whereas the present study considers the issue of m-Learning in higher education globally.

META-ANALYSIS OF CRITICAL SUCCESS FACTORS

Meta-analysis is basically a systematic literature review using quantitative means. This is different from the traditional literature review, where the analysis is arbitrary, theoretical, and, hence, highly subjective. Several different statistical procedures can be used during meta-analysis of existing studies. The only requirement is that these studies also have similar statistical findings as a result of investigation into the same or similar research questions (Booth et al., 2012).

Preliminary and partial results of this study were published and presented at the IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE2013) (Alrasheedi & Capretz, 2013a). The results of a meta-analysis conducted to evaluate the CSFs affecting m-Learning. One of the main barriers to conducting a systematic statistical analysis of literature into existing m-Learning studies is that the research questions addressed are highly subjective and examine a variety of the implications of m-Learning. Further, as none of the studies have actually prioritized the factors based on the extent of their influence to the success of m-Learning in higher education, there is no master list that can be used for identifying the presence of CSFs. To overcome this limitation, the present study makes use of all CSFs that came out of existing studies in the area of m-Learning, as discussed in the previous section. These form the basic variables for the meta-analysis. The first step of the meta-analysis study was to detect the presence of these variables in all the studies conducted by researchers on the existing m-Learning projects across the world.

The conditions for the present meta-analysis were:

- The studies must pertain to m-Learning in higher education.
- The studies must have been published in the last 6 years; the cut-off year is 2007. Studies published prior to this year are not included in the analysis.
- The studies must be quantitative, i.e., CSFs have been determined by making use of quantitative analysis methods.
- The description of quantitative analysis used in the study is clear (a few studies were discarded because the quantitative analysis used was arbitrary).

We found a total of 19 studies that satisfied the conditions for meta-analysis. In order to make the references to these studies easier, each study has been assigned a unique Roman numeral, alphabetically arranged in increasing order by date as in the most recent. The numerical list is shown in Table 1.

Table 1: Reference list of studies used during meta-analysis.

Author References	***Reference Number***	***Author References***	***Reference Number***
(Liaw & Huang, 2011)	**I**	(Seliaman & Al-Turki, 2012)	**XI**
(Cochrane, 2010)	**II**	(Bruck et al., 2012)	**XII**
(Hamdeh & Hamdan, 2010)	**III**	(Motiwalla & Bruck, 2013)	**XIII**
(Huang & Lin, 2007)	**IV**	(Wand et al., 2009)	**XIV**
(Özdoğan et al., 2012)	**V**	(Cochrane & Bateman, 2010)	**XV**
(Valk et al., 2010)	**VI**	(Cheon et al., 2012)	**XVI**
(Scornavacca et al., 2009)	**VII**	(Liu et al., 2010)	**XVII**
(Wu et al., 2012)	**VIII**	(Ju et al., 2007)	**XVIII**
(Alzaza & Yaakub, 2011)	**IX**	(Chanchary & Islam, 2011)	**XIX**
(Phuangthong & Malisawan, 2005)	**X**		

As mentioned, the source of the CSFs was a combination of previous studies as well as each of the 19 studies included in the analysis. The next step in the meta-analysis involved detecting the presence of various CSFs in each of the 19 studies and noting their presence and information. A total of 21 factors were discovered in the studies that researchers considered to be important for the success of m-Learning in higher educational institutions. Not all factors were, however, present in all the studies. Table 2 below shows the CSFs and the particular studies where these factors were considered to be important by the researchers (using the references from Table 1 above), and the total number of studies in which the CSFs were among the ones analyzed. This exercise was performed to understand the relative important of each factor.

Further, it is important to understand that the absence of a factor does not mean that it is less important; it means that the researchers (based on their observations and taking into consideration their specific context) have not considered the factor to be either applicable or important. Table 2 shows that factors such as institutional support, technical competence of instructors, and developed assessment techniques were considered only in a single study each. In contrast, some factors, such as ownership, have been cited in more than 10 studies. This disparity has crucial implications when the analysis is conducted using statistical means, as it will skew the comparative analysis. Hence, it is important to make the studies more balanced, which is why it was necessary to remove some of the studies from the eventual meta-analysis. This is the next step of the meta-analysis.

Table 2: Presence of CSFs in various studies.

CSFs	Appearance in Various Studies	
	Author References	***No. of Citations***
Availability	I, II, III	3
Accesibility	*II, III, IV, V, VI, VII, VIII, IX*	*8*
Affordability	II, VII	2
Internet Access	VI, IX, X, XI	4
Connectivity	III, V, IX	3
Choice of Mobile Devices	*II, VIII, IX, XII, XIII, XIV, XV*	*7*
Web 2.0 Software	II, XII, XV	3
Cross Platform Capability	*I, III, IX, XII, XIII, XIV, XV*	*7*
Ownership	*I, III, IV, VII, IX, X, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX*	*14*
Institutional Support	XV	1
Content	*I, III, V, VI, XIII, XVII*	*6*
Assimilation with Curriculum	III, VI, VII	3
Educator Perspectives	II, VII, XV	3
Learner Perceptions	***I, II, III, IV, V, VII, IX, XII, XIII, XIV, XV, XVI, XVII, XVIII***	***15***
Learning Community Development	*I, II, III, V, VI, IX, XIV, XV*	*8*
Develop Assessment techniques	II	1
Faculty Commitment	II, VI, VII, XV, XVI	5
User Feedback	II, IV, VI, VII, XV	5
Technical Competence of Instructors	VI	1
Technical Competence of Students	*I, II, IV, VI, IX, XI, XII, XIII, XIV, XV, XVII*	*11*
User Friendly Design of Content	*I, II, III, IV, X, XIII, XIV, XVI, XVII, XVIII*	*11*

Based on the paper by Teoh (2011), the variables, i.e., the CSFs, can be divided into four categories – technology, management support, teaching pedagogy, and learning approach. As seen in Table 3 below, some factors, such as assimilation with curriculum, fall into multiple categories meaning that there is an overlap based on the categories of people influencing the particular variable. The CSFs can be further divided into three main categories – from student perspectives, from instructor perspectives, and from management perspectives.

Table 3: Classification of CSFs.

Variables	CSF Categories
Availability	Technology
Accessibility	
Affordability	
Internet access	
Connectivity	
Choice of Mobile Devices	
Web 2.0 software	
Cross-platform capability	
Ownership	Management Support
Institutional Support	
Administrative support	
Assimilation with Curriculum	
User feedback	
Educator perceptions	Teaching Pedagogy
Technical competence of	

instructors	
Faculty commitment	
Develop assessment techniques	
User feedback	
Assimilation with Curriculum	
Learning community development	Learning Approach
User feedback	
Learner perceptions	
Technical competence of students	
User friendly design of content	
Assimilation with Curriculum	

An interesting part of the analysis was that learner perceptions was included in every single study and all of the studies had evaluated the CSFs from this perspective. Any m-Learning platform had two other sets of users – the instructors, and university management and administration. These have not been the focus of evaluative studies, which is a major drawback of the present study. Coming back to the present evaluative study, it can be seen that most of the pilot studies conducted in the area of m-Learning tend to evaluate the success from the perspective of learners, in other words, the factors that are important for learners to ensure that m-Learning is successfully adopted within a tertiary education institution. This is the tentative choice for the independent variable (highlighted in bold in Table1).

As discussed before, the next step involves removing the CSFs that have appeared in very few studies so that only significant CSFs are considered. The removal of the studies has been conducted by using a threshold, i.e., the minimum number of studies in which a factor has to appear before it is included in the meta-analysis. This threshold was chosen to be six, which is a little less than half of the maximum number of appearances (learner perceptions – 15). Applying the threshold results in a total of nine CSFs that have been plotted against the number of citations in Figure 1.

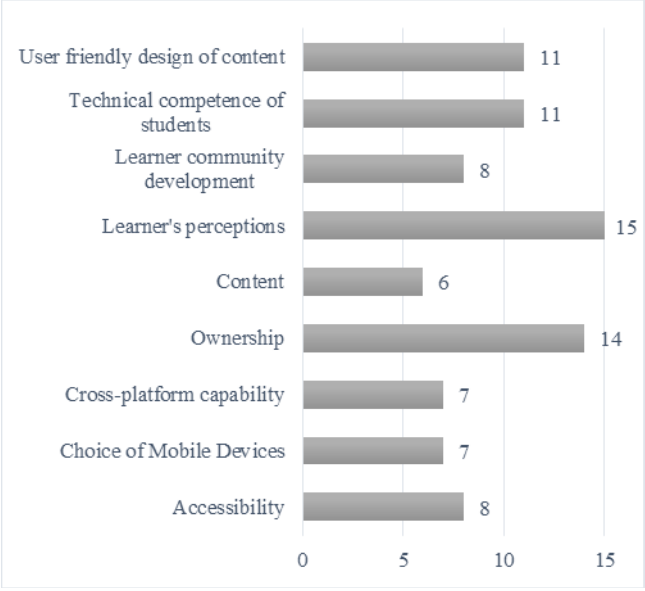


Figure 1. Plot of Shortlisted CSFs against the number of citations.

From Figure 1 above, the nine shortlisted critical success factors are – user friendly design, technical competence, learner community development, learner perceptions, content, ownership, accessibility, choice of mobile device, and cross platform capability.

The next step of the meta-analysis involved conducting in-depth studies of the statistical information available on these nine shortlisted CSFs. The purpose was to understand whether there was sufficient information for each

of the factors to conduct a meta-analysis using statistical techniques. The study showed that not enough statistical data was available for three of the CSFs – accessibility, choice of mobile device, and cross platform capability. Hence, these three factors had to be excluded from the final list. This resulted in a total of six CSFs being used for the purpose of meta-analysis (shown in italics, both regular and bold fonts, in Table 4 below).

At this point, it is important to point out that the fact that only six of the 21 CSFs were shortlisted means that these six factors are considered by all researchers studying m-Learning to be important. The remaining factors may be important too, but corroborating their importance would require researchers to include these factors as a part of the study. These six factors – user friendly design, technical competence, learner community development, learner perceptions, content, and ownership – would not be used for a cross-sectional analysis across multiple studies.

The next step of the meta-analysis required shifting focus back to the papers to find out if sufficient statistical information was available for analysis. In other words, the six critical factors must be presented in a similar or at least inter-convertible statistical form so that they can be assessed on a comparative scale. In addition to determining the CSF, one of the objectives of the present study was also to determine the influence each factor has on the success of m-Learning in higher educational institutions. This requires comparison among the CSFs and, hence, this exercise. Our analysis showed that only nine of the 18 studies had similar statistical information that could be used for conducting meta-analysis – I, V, VII, IX, XI, XIII, XVI, and XVIII. This also means that the remaining 10 studies – II, III, IV, VI, VIII, X, XII, XIV, XV, and XIX – were discarded as they either used very different statistical measurements or did not have sufficient raw data required for analysis. The six CSFs and their corresponding statistics in the nine studies are enumerated in Table 4 below.

Table 4: CSF statistics in the shortlisted studies.

Statistics	**Critical Success Factors**					
	User Friendly Design	***Technical Competence***	***Learner Community Development***	***Learner Perceptions***	***Content***	***Ownership***
	Based on (Liaw & Huang, 2011) No of Participants 168					
SD	3.63	2.74	4.03	3.43	4.09	3.14
Mean	1.39	1.65	1.39	1.53	1.24	1.57
	Based on (Özdoğan, Başoğlu, & Er etin, 2012) No of Participants 81					
SD	4.27	4.05	3.4	3.85	3.63	3.95
Mean	0.97	1.18	1.37	1.01	1.32	1.04
	Based on (Scornavacca, Huff, & Marshall, 2009) No of Participants 569					
SD	4.04	Na	4.05	3.71	2.95	3.67
Mean	1	Na	1.02	1.06	1.01	1.1
	Based on (Alzaza & Yaakub, 2011) No of Participants 261					
SD	4.05	Na	3.91	3.87	4.5	Na
Mean	0.63	Na	0.66	0.76	0.81	Na
	Based on (Seliaman & Al-Turki, 2012) No of Participants 55					
SD	Na	4.02	Na	4.12	Na	4.01
Mean	Na	1.06	Na	0.66	Na	0.71
	Based on (Motiwalla & Bruck, 2013) No of Participants 33					
SD	3.3	3.11	Na	2.43	2.49	3.97
Mean	0.79	1.02	Na	1.15	1.16	1.07
	Based on (Cheon, Lee, Crooks, & Song, 2012) No of Participants 177					
SD	3.72	3.9	Na	3.48	3.71	3.71
Mean	1.44	1.14	Na	1.44	1.29	1.35
	Based on (Liu, Liu, & Carlsson, 2010) No of Participants 219					
SD	3.8	Na	Na	3.33	Na	3.31
Mean	1.24	Na	Na	1.3	Na	1.31
	Based on (Ju, Sriprapaipong, & Minh, 2007) No of Participants 245					
SD	2.36	Na	Na	2.19	2.38	2.23
Mean	1.06	Na	Na	1.16	1.12	1.16

From Table 4 above it is clear that the CSF learner perceptions is present in all the nine studies shortlisted above. As discussed earlier, learner perceptions were present in the maximum number of studies. The presence of

learner perceptions in all nine studies indicates that learner perceptions actually refers to whether the learners would consider opting for m-Learning in the future based on their current experiences. As the success of m-Learning directly refers to the continued usage of an m-Learning platform, this CSF becomes even more important. In fact, in several studies, learner perceptions were actually correlated with other CSFs as a means for judging the success of mobile l-Learning in a particular institution.

The present meta-analysis also uses learner perceptions as a means of assessing the success of m-Learning in various institutions, i.e., as a dependent variable. The individual correlations are not available for some of the nine studies, hence the meta-analysis consisted of aggregating the mean values of the remaining five CSFs for these studies and then correlating them with learner perceptions. Microsoft Excel was used as a means of performing this operation. The meta-analysis conducted by Ravesteyn and Batenburg is the basis for the present study (Ravesteyn & Batenburg, 2010). The meta-analysis results are shown in Table 5 below.

Table 5: Meta-analysis of CSF Statistics.

CSFs	Meta-Analysis Statistics					
	No. of Studies	***No. of Participants***	***Net Mean***	***Net SD***	***CSF Rank***	***Pearson Corr.***
Learner Perceptions	9	1808	3.379	1.119	NA	1
User Friendly Design	8	1753	3.646	1.065	3	0.92961
Learner Community Development	5	514	3.564	1.21	4	0.64153
Technical Competence	4	1079	3.848	1.11	2	-0.5595
Content	7	1289	3.958	1.136	1	0.80454
Ownership	8	1547	3.499	1.164	5	0.6064

RESULTS AND DISCUSSION

The success of m-Learning is dependent on the views of the users of the m-Learning platform. The popularity of mobile phones in the present day world cannot be denied; neither can their increased invasion into all aspects of people's lives. Despite this, the use of mobile technology in the educational sector has been limited. Consequently, higher educational institutions have recently been looking at several methods of implementing m-Learning strategies (Alrasheedi & Capretz, 2013b). As the popularity and the all-encompassing nature can only come through a favorable user perception, it can be concluded that the users have certain reservations when it comes to the use of mobile technology in the educational sector. The objective of this paper is to assess user perceptions of what users consider to be the key factor necessary for the successful adoption of m-Learning in educational institutions. We conducted a meta-analysis of existing studies that evaluated the CSFs of the m-Learning platform. The results of the analysis are given in Table 5 above.

Table 4 shows the aggregated results from the meta-analysis of nine similar studies conducted measuring the CSFs of m-Learning. The independent observation of the means shows the response tendency on a 5-point Likert scale (1 – strongly disagree to 5 – strongly agree). This shows that a mean over 2.5 indicates that learners agree that the factor has an appreciable influence on their current experience with the m-Learning platform. From Table 5, it can be seen that all six CSFs have an aggregate response higher than 2.5, indicating that each of these factors has an appreciable influence on their current experience with the m-Learning platform.

The rankings of the means of the responses, given in Table 5, show how much influence the factor has on the potential success of m-Learning, according to the learners. It is seen that content is considered to have the most influence, followed by technical competence of learners, user friendly design, learner community development, and ownership.

The next step is to find if the factors are seen to positively affect learner perceptions of m-Learning. As discussed earlier, correlation of the CSFs with learner perceptions is a means of judging the success factors of m-Learning from learner perspectives. Both content and user friendly design have highly positive correlations with learner perceptions. This means that both good content and user friendly design of the content are essential to learners if they are to choose an m-Learning platform in the future. Ownership, i.e., flexibility to use m-Learning anytime and anyplace, and learner community development, i.e., using the m-Learning platform to connect with other learners or educators, are also positively related with learner perceptions. This means that learners view both of these factors as important. Interestingly, technical competence is negatively correlated with learner perceptions. Developing the right evaluation framework will enable researchers and m-Learning stakeholders to get a true picture of the current status of m-Learning implementation and adoption within the educational institution; it can then also be used as a roadmap for success that includes adoption of m-Learning at important milestones (Alrasheedi & Capretz, 2013c). This means that learners consider that they already have technical capabilities

(since mobile phones are ubiquitous in the present day world), and so the factor is not critically important in their choice for selecting the m-Learning platform in future.

CONCLUSIONS AND RECOMMENDATIONS

The goal of this study has been to extend our understanding of the CSFs that affect the m-Learning platform in higher educational settings. A meta-analysis of multiple studies was conducted on the lines of the inspiring study by Naismith & Corlett (2006) using updated data, though the version also improves upon the 2006 study by conducting it as a systematic statistical analysis. This would help in assessing the influence of each CSF on the success of m-Learning in higher education.

An important observation made during the study was that usually the success of m-Learning is considered only based on perceived benefits from learner perspectives (students). This neglects other important users such as the instructors and members of the university management and administration. These people are the first in line to accept or reject any new learning paradigm. They are also responsible for motivating university students into trying out the new platform and helping with the glitches. Unless detailed information is available on how users of these categories think, the information available for the success of m-Learning is incomplete. This means that the universities will have to assess the opinions of their students before any m-Learning initiative is begun.

The categorical division of the CSFs gave a general idea about the causes of the success of m-Learning initiatives in different countries. A careful look at Table 3 above shows that the success factors, when examined from the category perspective, are fairly evenly distributed. This means that m-Learning success depends on a set of factors, only one part of which is technical.

The meta-analysis of the literature review also showed that some aspects – such as the technical competence of educators, the development of assessment techniques, and institutional support – have been considered by very few studies as success factors. This does not mean that the factors are not important. It is in fact a possible explanation of the slow adoption of the technology in the educational sector. As a future study, we are working on systematically surveying the CSFs for m-Learning to investigate and classify these CSFs into different groups such as from the perspectives of students, instructors, and university management. This would be promising background for proposing a new conceptual framework to comprehensively study and analyze the relationship among the CSFs from related perspectives.

ACKNOWLEDGMENT

The first author would like to thank the ministry of higher education (MOHE) in Saudi Arabia for his personal fund and the scholarship.

REFERENCES

Adeyeye, M. O., Musa, A. G., & Botha, A. (2013). Problem with multi-video format m-learning applications. In J.-E. Pelet, E-Learning 2. 0 Technologies and Web Applications in Higher Education (pp. 294-330). New York: IGI Global.

Ali, A., Ouda, A., & Capretz, L. F. (2012). A conceptual framework for measuring the quality aspects of mobile learning. *Bulletin of the IEEE Technical Committee on Learning technology, 14*(14), 31-34.

Alrasheedi, M. & Capretz, L.F. (2013a). A Meta-Analysis of Critical Success Factors Affecting Mobile Learning, *Proceedings of IEEE International Conference on Teaching, Assessment and Learning for Engineering*, Bali, Indonesia, pp. 262-267.

Alrasheedi, M., & Capretz, L. F. (2013b). Applying CMM towards an m-learning context. In International Conference on Information Society (i-Society), (pp. 146-151). IEEE.

Alrasheedi, M., & Capretz, L. F. (2013c). Developing a Mobile Learning Maturity Model. International Journal for Infonomics (IJI), 6(3/4), 771- 779.

Alzaza, N. S., & Yaakub, A. R. (2011). Students' awareness and requirement of mobile learning in higher education environment. America Journal of Economics an Business Administration, 3(1), 95-100.

Andrews, T., Smyth, R., Tynan, B., Berriman, A., Vale, D., & Cladine, R. (2010). Mobile technologies and rich media: expanding tertiary education opportunities in developing countries. In A. G. Abdel-Wahab, & A. A. El-Masry, Mobile Information Communication Technologies Adoption in Developing Countries: Effects and Implication. New York: Idea Group Inc.

Booth, A., Papaioannou, D., & Sutton, A. (2012). Approaches to successful literature review. California: SAGE.

Bruck, P. A., Motiwalla, L., & Foerster, F. (2012). Mobile elarning with micro-content: a framework and evaluation. 25th Bled e-Conference eDependability: Reliable and Trustworthy eServices for the Future, 527-543.

Capuruço, R. A., & Capretz, L. F. (2010). Integrating recommender information in social ecosystems decisions. In Proceedings of the Fourth European Conference on Software Architecture: Companion Volume (pp. 143-150), ACM.
Chanchary, F. H., & Islam, S. (2011). Mobile learning in Saudi Arabia - prospects and challenges. International Arab Conference on Information Technology (ACIT'2011). Jordan: Zarqa University.
Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. Computer & Education, 59, 1054-1064.
Cochrane, T. D. (2010). Exploring mobile learning success factors. Research in Learning Technology, 18(2), 133-148.
Cochrane, T. D. (2014). Critical success factors for transforming pedagogy with mobile Web 2.0. British Journal of Educational Technology, 45(1), 65-82.
Cochrane, T. D., & Bateman, R. (2010a). Reflections on 3 years of m-learning implementation (2007-2009). Sheffield: Sheffield Hallam University Research Archive.
Cochrane, T. D., & Bateman, R. (2010b). Transforming pedagogy using mobile web 2.0. In Web-based Education: Concepts, Methodologies, Tools and Applications, Volume 1 (pp. 671-698). New York: Idea Group Inc (IGI).
Hamdeh, M. A., & Hamdan, A. (2010). Using analytical hierarchy process to measure critical success factors of m-learning. European, Mediterranean & Middle Eastern Conference on Information Systems. Abu Dhabi.
Huang, J. H., & Lin, Y. R. (2007). Elucidating user behavior of mobile learning: a perspective of the extended technology acceptance model. The Electronic Library, 25(5), 585-598.
Ju, T. L., Sriprapaipong, W., & Minh, D. N. (2007). On the Success Factors of Mobile Learning. 5th International Conference on ICT and Higher Education. Bangkok.
Kukulska-Hulme, A., & Taxler, J. (2007). Designing for mobile and wireless learning. In H. Beetham, & R. Sharpe, Rethinking Pedagogy for a Digital Age: Designing and Delivering e-Learning (pp. 180-192). London: Roultedge.
Liaw, S. S., & Huang, H. M. (2011). Exploring learners' acceptance toward mobile learning. In T. Teo, Technology Acceptance in Education: Research and Issues (pp. 145-157). Sense Publishers.
Liu, Y., Liu, H., & Carlsson, C. (2010). Factors driving the adoption of m-learning: an empirical study. Computers & Education, 22, 1211-1219.
Motiwalla, L., & Bruck, P. A. (2013). Adoption of a micro-learning system. *Tenth AIMS International Conference on Management*, Austria, 1001-1008.
Moura, A., & Carvalho, A. (2010). Mobile learning: using SMS in educational contexts. In N. Reynolds, & M. Turcsányi-Szabó (Ed.), Key Competencies in the Knowledge Society, World Computer Congress (pp. 281-291). Brisbane: Springer.
Naismith, L., & Corlett, D. (2006). Reflections on success: a retrospective of the mLearn conference series 2002-2005. mLearn 2006 – Across generations and cultures. Banff.
Özdoğan, K. M., Başoğlu, M., & Er etin, G. (2012). Exploring major determinants of mobile learning adoption. Proceedings of PICMET '12: Technology Management for Emerging Technologies (pp. 1415-1423). IEEE.
Paul, J., & Seth, R. (2012). Japan-India diplomacy and relationship marketing. In Paul, International Marketing – text and Cases (2nd ed., pp. 178-180). New Delhi: Tata McGraw-Hill Education.
Phuangthong, D., & Malisawan, S. (2005). A study of behavioral for 3G mobile internet technology: preliminary researh mobile learning. Proceedings of the Second International Conference on e-Learning for Knowledge-Based Society, (pp. 1-17). Bangkok.
Quinn, C. N. (2011). The mobile academy: mLearning for higher education. San Francisco: John Wiley & Sons.
Ravesteyn, R., & Batenburg, R. (2010). Surveying the critical success factors of BPM-systems implementation. Business Process Management Journal, 3, 492-507.
Saccol, A., Barbosa, J. L., Schlemmer, E., & Rienhard, N. (2010). Corporate m-learning: applications and challenges. In R. Guy, Mobile Learning: Pilot Projects and Initiatives. California: Information Science.
Scornavacca, E., Huff, S., & Marshall, S. (2009). Mobile phones in the class: if you can't beat them, join them. *Communications of the ACM*, *52*(4), 142-146.
Seliaman, M. E., & Al-Turki, M. S. (2012). Mobile learning adoption in Saudi Arabia. World Academy of Science, Engineering and Technology, 69, 391-293.
Teoh, K. K. (2011). An examination of critical success factors in the implementation of ePortfolios in universities. *Journal of Academic Language and Learning, 5*(2), A60-A72.
The World Bank Institute. (2012). Behavioral change using technology. Retrieved March 1, 2014, from http://wbi.worldbank.org/wbi/content/behavioral-change-using-technology
Tsai, L. H., Young, S. S., & Liang, C. H. (2005). Exploring the course development model for the mobile learning context: a preliminary study. Fifth IEEE International Conference on Advanced Learning Technologies ICALT05, 5-8.

UNESCO. (2011). UNESCO mobile learning week report. Retrieved March 1, 2014, from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/ICT/pdf/UNESCO%20MLW%20report%20final%2019jan.pdf

Valk, J. H., Rashid, A. T., & Elder, L. (2010). Using mobile phones to improve educational outcomes: an analysis of evidence from Asia. International Review of Research in Open and Distance Learning, 11(1), 117-140.

Vate-U-Lan, P. (2008). Mobile learning: major challenges for engineering education. 38th ASEE/IEEE Frontiers in Education Conference (pp. 11-16).

V t j , H., M nnist , A., Vainio, T., & Jokela, T. (2009). Understanding user experience to support learning for mobile journalist's work. In G. R, The Evolution of Mobile Teaching and Learning (pp. 177-210). California: Informing Science Press.

Wand, Y. S., Wu, M. C., & Wang, H. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. British Journal of Educational Technology, 4(1), 92-118.

Wilen-Daungenti, T. (2008). Edu technology: technology and learning environments in higher education. New York: Peter Lang.

Wu, W. H., Wu, Y. C., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. (2012). Review of trends from mobile learning studies: a meta-analysis. Computers & Education, 59, 817-827.

Zeng, R., & Luyegu, E. (2011). Mobile learning in higher education. In A. D. Olofsson, & J. O. Lindberg, Informed Design of Educational Technologies in Higher Education: Enhanced Learning and Teaching (pp. 292-306). Hershey, Philadelphia: Idea Group Inc (IGI).

EFL Learners' Attitudes towards Using Computers as a Learning Tool in Language Learning

Orachorn Kitchakarn
Bangkok University, Thailand
orachorn.k@bu.ac.th

ABSTRACT
The study was conducted to investigate attitudes toward using computers as a learning tool among undergraduate students in a private university. In this regards, some variables which might be potential antecedents of attitudes toward computer including gender, experience of using computers and perceived abilities in using programs were examined. Data was collected from 192 undergraduate students enrolled in two fundamental English courses (EN012 & EN 013). The instrument in this study was a questionnaire. The findings revealed that students had positive attitudes towards using computers as a learning tool. The factors of gender and experience of using computers were not found to affect students' attitudes while the factor of perceived abilities in using programs had an effect on their attitudes.

Keywords: computer, attitude, EFL students, language learning

INTRODUCTION
When moving from the teacher-centered instruction to student-centered instruction, technology is the important support to develop the students learning. Computers become powerful tools in educational settings. They provide facilities and support to students' learning activities (Isman,et al (2004). Recently, there has been a substantial increase in interest and activity in using computers to improve quality in teaching and learning. Computer-based learning has an impact on education by affecting students' productivity (İşman, A., Çağlar, M., Dabaj, F., Altınay, Z. & Altınay, F., 2004). Computers provide valuable learning experiences for young children and show a great impact on their learning and development (Chen & Chan, 2006; Kerawalla & Crook, 2010; Sackes, Trundle, & Bell, 2011; Lim, 2012).

While learning English, computers can support and facilitate the roles of the teacher in order to enhance students' skills to perform well in reading, writing, listening and speaking activities. Using computers and Internet can improve EFL learners' language abilities, and they also reach real learning experiences. In addition, computers contribute beneficially to learners' learning and development (McNabb, 2005; Chen & Chan, 2006; Kerawalla & Crook, 2010; Theodotou, 2010; Amendum, Vernon-Feagans, & Ginsberg, 2011; Sackes, Trundle, & Bell, 2011; Lim, 2012). They gain the opportunity to access useful language resources and communicate with native English speakers through computers and Internet. Moreover, students can learn listening, speaking, reading and writing English through real-world situations (Yang & Chen, 2007). In addition, computers are important in language learning because they help students to think critically in their learning process and make them have active and stable knowledge. That is, they are provided with more creative activities through using computers.

Computers also facilitate teachers in their teaching. Teachers can handle a lot of activities and carry out programmed functions at amazing speed through computers. They can check exercises after students are done anytime anywhere. Computers also help to solve the problem of individual difference. In this regard, students can be given the tasks that suit their ability. They can be moved gradually from easier to more difficult tasks according to their levels. They can be stimulated, drilled or explained a certain task when they fail to do it successfully by using computers. (AlKahtan, 1999 cited in Ahmad & Sulaiman, 2013).

When computers are implemented in language courses, the students' roles, attitudes, reflections are important points to be considered in terms of the effectiveness of technology use in instruction. Related literature indicated that EFL learners usually had positive attitudes towards the computer technology use in classrooms (Abu Jaber & Abu Omar, 2000; Garcia, 2001; Daigle, 2003; Isman et al, 2004; Karakas, 2011; Abedalaziz, Jamaluddin & Leng, 2013; Award & Alkaraki, 2013). Similarly, Kutluca Tamer(2011) determined the status of computer usage and the attitudes toward computers of prospective preschool teacher and to investigate of several variables on their attitudes. Results indicated that prospective preschool teachers had positive attitudes toward computers about taking computer course and computer ownership. The findings indicated that learners placed a lot of importance on using computers in their study.

When the factor of gender was taken into consideration, female students tend to have more positive attitudes towards learning and working with computers (Hashim & Mustapha (2004). Kay (2008) found that males have

significantly more positive affective attitudes toward computers. However, in many studies, gender did not have an impact on learners' attitudes. For instance, there was no significant difference between male and female students in their attitudes towards Internet and computer use (Abedalaziz, Jamaluddin & Leng, 2013). There were not even significant differences between male and female students in terms of being motivated to use computers and computer facilities for communication and writing (Karakas, 2011; Isman et al, 2004).

When the factor of experience or year of using computers was investigated, most findings revealed a possible impact on learners' attitudes. For example, in Miltra (1998)'s study, respondents who reported higher use of computers indicated a more positive attitude toward computers on all the different attitude scales. The result suggested that computers were used for several different activities, and the level of use was related to attitudes toward computers. Similar finding was stated in a study conducted by Divine and Wilson (1997). It showed that students with more experience in computing showed more positive attitudes toward computers, clearly in terms of confidence and non-anxiety. Likewise, many studies reported that greater frequency of computer use leads to positive attitude (Garland & Noyes, 2004; Teo, 2006). There was only a study which showed that experience in using computers did not affect learners' attitudes (Isman et al, 2004).

Computer knowledge is a critical factor which should not be disregarded. Mohd et al (2007) found a significant correlation between computer attitudes and students' computer skills. Similarly, in a study conducted by Norzaidi et al (2007), a significant correlation was found between the students' attitudes towards computers and their computer skill levels.

RESEARCH QUESTIONS

1. What are students' attitudes towards using computers as a learning tool?
2. Are there any statistically significant differences in students' attitudes towards using computers as a learning tool based on gender, perceived abilities in using programs and experience of using computers?

RESEARCH METHODOLOGY

Population and Samples

The population of this study was 400 undergraduate students who enrolled in EN 012: English for Daily Life and EN 013: English for Expressing Ideas in the first semester of 2012 academic year. The sample size was calculated based on Krejcie and Morgan Table. When the population is 400, the samples should be at least 196. The researcher decided to use 200 samples. 100 students are those studying EN012, and 100 students are those studying EN 013. However, when the questionnaires were returned and checked, it was found that only 192 out of 200 questionnaires had been completely filled out. So, there were 192 samples in this study.

Research Instrument

In order to investigate students' attitudes towards using computers as a learning tool, a questionnaire was used to collect the data. The first part gathered personal information from the respondents who were asked to answer the questions on gender, age, computer ownership, school they graduated, and experience of using computers. The second part consisted of six items, asking students to rate their abilities in using programs in a form of five-rating scale. The third part was a survey of students' attitudes towards using computers as a learning tool. This part contained 16 items and was in a form of five-rating scale.

As for the validity of the questionnaire, the draft questionnaire was examined and corrected by three specialists in English teaching field. Two items were changed at the stage of expert validation. The values of congruence index for items in five-point rating scale parts were proper, as they were between 0.67 and 1.00. The congruence index for the whole questionnaire was 0.96. To investigate the internal consistency among all items, the questionnaire was piloted with 30 students and calculated for reliability value using Cronbach's Coefficient Alpha. The result revealed that the reliability coefficient value was 0.795, which depicted rather high internal consistency in almost all of the items.

Data Analysis

Data were statistically recorded and analyzed by SPSS/Window program. Frequencies and percentages were used to analyze personal data of the respondents. The mean scores from the second part were calculated to indicate the degree of ability of using programs based on the criterion of ±.5SD. The average mean of ability was 3.72 with standard deviation of .47. So, a mean score of 3.96–5.00 indicated a high level, 3.49–3.95 indicated a moderate level and a mean score of 1.00–3.48 indicated a low level.

Table 1 Perceived Abilities in Using Programs Shown in Three Groups

Group	Range of Score	Number
low	Lowest through 3.48	65
moderate	3.49-3.95	55
high	3.96-5.00	72

Means and standard deviations were utilized to answer the first research questions and presented in a table based on the following ranges: 1.00-1.50 = very negative, 1.51-2.50 = negative, 2.51-3.50 = moderate, 3.51- 4.50 = positive, 4.51-5.00 = very positive. To answer the second research question, t-tests and One-way Analysis of Variance were employed to compare students' attitudes towards using computers as a learning tool in terms of gender, perceived abilities in using programs and years of using computers. Tukey's multiple comparison tests were further conducted to find out differences of each pair.

RESULTS

The samples of this research are 192 undergraduate students enrolled in two English courses. Of these, 63.5% are female and 36.5% are male. The majority of them (92.7%) are aged between 18-20 years, and the rest (7.2%) are more than 20 years old. When categorized by types of school they graduated, 66.7% of the respondents report they come from government schools while 33.3% of them are from private schools. In addition, 99.5% of them have their own computer while .5 % has no computer.

Table 2 Personal Data of Respondents' Shown in Frequency and Percentage

	Frequency	Percentage
1. Gender		
- Male	70	36.5
- Female	122	63.5
2. Age		
- 18-20 years	178	92.8
- > 20 years	14	7.2
3. School		
- Government	128	66.7
- Private	64	33.3
4. Experience of using computers		
- 1-10 years	89	46.4
- More than 10 years	103	53.6
5. Computer Ownership		
- Yes	191	99.5
- No	1	.5

Results Pertaining to Research Question 1

Table 3 shows that all items exhibited mean values above 3.51, and the overall mean score was 4.05, indicating positive attitudes toward using computers as a learning tool. When considering each item, it was found that the third highest mean scores were no.3 (Using the computer helps learners search and get information related to English language and others from around the world , $\bar{X}$= 4.33), no. 4 (Using the computer in learning English makes me more enjoyable, $\bar{X}$= 4.22), and no. 2 and 16 (Using the computer while doing activities or assignments saves time/ Using the computer in learning English makes me download teaching materials or upload assignment and homework easily, $\bar{X}$= 4.17). However, the attitudes toward using the computer as a learning tool which help them improve grammatical knowledge were reported as the lowest mean score (No. 13, $\bar{X}$= 3.81).

Table 3 Students' Attitudes towards Using Computers as a Learning Tool

Items	Mean	S.D.
1. Using the computer makes me learn and do my assignments easier and more convenient.	4.13	.78
2. Using the computer while doing activities or assignments saves time.	4.17	.76
3. Using the computer helps learners search and get information related to English language and others from around the world.	4.33	.70

4. Using the computer in learning English makes me more enjoyable.	4.22	.68
5. Using the computer in learning English increases my creativity.	3.99	.65
6. Using the computer in learning English increases my productivity.	4.03	.74
7. Using the computer in learning English makes learners more autonomous.	4.10	.72
8. Using the computer in learning English improves learners' critical thinking.	3.92	.74
9. I have more opportunities to practice my writing while using the computer.	3.87	.76
10. While using the computer, I can improve my reading skills.	4.10	.69
11. Using the computer in learning English helps me learn and use new vocabularies.	4.10	.68
12. Using the computer in learning English helps me practice my listening and speaking skills easily.	3.88	.70
13. Using the computer in learning English helps me improve grammatical knowledge.	3.81	.79
14. Using the computer in learning English helps me communicate with my teacher and classmates easily.	3.97	.77
15. Using the computer in learning English helps me update my course information.	3.91	.70
16. Using the computer in learning English makes me download teaching materials or upload assignment and homework easily.	4.17	.78
Total	4.05	.51

Results Pertaining to Research Question 2

This research question asked about differences among students' attitudes towards using computers as a learning tool in terms of gender, experience of using computers, and perceived abilities in using programs.

Table 4 indicates that male and female students had similar attitudes towards using computers as a learning tool ($\bar{X}$= 4.05, 4.04). T-test analysis was conducted to examine a significant difference in students' attitudes between the two groups. The result reveals that no statistically significant difference was found in attitudes between male and female at the level of .05. This means that male students had the same attitudes as female students.

Table 4 A Comparison of Attitudes Classified by Genders

Variable		n	Mean	S.D.	t	Sig
genders	male	70	4.05	.53	.209	.834
	female	122	4.04	.49		

When the t-test was used to find out whether experience of using computers had an effect on students' attitudes towards using computers or not, it was found that there was no statistically significant difference in attitudes between the two groups of students with long and short experience of using computer. As shown in Table 5, the students' attitudes towards using computers as a learning tool did not depend on how long they used computers.

Table 5 A Comparison of Attitudes Classified by Experience of Using Computers

Variable		n	Mean	S.D.	t	Sig
Experience of Using Computers	1-10 yrs.	89	4.04	.48	-.079	.937
	> 10 yrs.	103	4.05	.52		

Table 6 demonstrated means and standard deviations of students' attitudes after they were categorized into three groups based on perceived ability of using programs. The findings showed that mean scores of low, moderate, and high abilities were 3.72, 4.09, and 4.30 accordingly.

Table 6 A Comparison of Attitudes Classified by Perceived Abilities of Using Programs

Variable		n	Mean	S.D.
Ability of Using Program	Low	65	3.72	.50
	Moderate	55	4.09	.39
	High	72	4.30	.42

Table 7 indicated that the F value was 30.153 with a P value of .000, so this was significant at P< .05. The results showed that the students' attitudes towards using computers as a learning tool were dependent on their perceived abilities of using programs (low, moderate, high). That is, at least one pair differed in their attitudes.

Table 7 Differences among the Three Groups of Abilities of Using Programs Regarding Attitudes towards Using Computers as a Learning Tool

Source of Variances	Sum of Squares	Degree of Freedom	Mean Square	F
Between Groups	11.797	2	5.898	30.153**
Within Groups	36.971	189	.196	
Total	48.767	192		

P < .05

Therefore, Tukey multiple comparison tests were further conducted to determine which groups significantly differed. The results indicated that three pairs had different attitudes toward using computer as a learning tool. That is, statistically significant differences were found between students with low ability and those with moderate ability, students with moderate ability and those with high ability, as well as students with low ability and those with high ability.

Table 8 The Results of Tukey Tests for the Differences in Students' Attitudes

Perceived Abilities of Using Program		Mean Differences	Sig
Low	Moderate	.371	.000
Moderate	High	-.213	.029
Low	High	.584	.000

DISCUSSION

It is no doubt that students perceived the usefulness of using computers as a learning tool due to their positive attitudes. The finding goes in line with EFL learners in other studies who had positive attitudes towards the computer technology use in classroom (Abu Jaber & Abu Omar, 2000; Garcia, 2001; Daigle, 2003; Isman et al, 2004; Karakas, 2011; Abedalaziz, Jamaluddin & Leng, 2013; Award & Alkaraki, 2013). The finding indicates that most students prefer to use computers in language learning because computers can help them search and get information related to their studies around the world. They can learn listening, speaking, reading and writing English through real-world situations (Yang & Chen, 2007). Moreover, they can store and display information more easily. It saves their time in doing tasks. The finding can be supported by Salih Usun and Kampusd Anafartalar (2004) who stated that computers help learners do assignments more efficiently.

It is interesting to find that abilities of using programs have an impact on students' attitudes toward using computers as a learning tool. This is probably because the respondents might have difficulty in using some programs. Not knowing much about programs makes them work ineffectively. For instance, when students were assigned to use PowerPoint to make a presentation, it may take them some time to learn more about the useful tools in this program before work. The finding was found to be similar to some studies which found a significant correlation between students' attitudes towards computers and their computer skill levels (Mohd et al, 2007; Norzaidi et al, 2007).

Based on the finding, gender did not have an effect on students' attitudes towards using computers as a learning tool. That is, female students had similar attitudes to male students. This might be because both male and female students had to fulfill the same requirement of the course. They similarly use computers as a tool to complete the given tasks and assignments. Both male and female students recognize the importance of using computers in language learning. The finding was found to be similar to many previous studies in that there was no significant difference between male and female students in their attitudes towards Internet and computer use (Abedalaziz, Jamaluddin & Leng, 2013; Karakas, 2011; Isman et al, 2004).

This study also found that years or experience of using computers did not have an impact on attitudes. This might be because young people can adapt themselves to a rapidly changing world where technology has become central to lives. They learn to use a wide range of technologies without difficulty. Basically, computers are perceived as the most important learning tool that can be used to facilitate learning and in daily lives. As a result, users did not differ widely in their attitudes towards using computers. The finding was similar to that in one study (Isman et al, 2004), but it was not in accordance with most studies which found that students with more experience in computing showed more positive attitudes toward computers (Miltra, 1998; Garland & Noyes, 2004; Teo, 2006).

REFERENCES

Abedalaziz,N., Jamaluddin, S., & Leng, C.H. (2013)Measuring Attitudes towards Computer and Internet Usage among Postgraduates Students in Malaysia. TOJET: The Turkish Online Journal of Educational Technology – April 2013, Volume 12 Issue 2.

Al-Khadash and Al-Bishtawi, (2009) Attitudes toward learning accounting by computers: The impact on perceived Skills. Journal of Accounting and Taxation Vol.1 (1), pp 001-007, April, 2009.

Amendum, S., Vernon-Feagans, L; Ginsberg, M.(2011). The Effectiveness of a technologicallyfacilitated classroom-based early reading intervention: TheTargeted Reading Intervention, *Elementary School Journal*, *112*(1), 107-131.

Award and Alkaraki (2013). Attitudes of students towards using computers in learning English. English for Specific Purposes World, Issue 37, Vol,13, 2013.

Chen, J. & Chan, C. (2006). Using computers in early childhood classrooms: teachers' attitudes, skills and practices. *Journal of Early Childhood Research, 4*(2),169-188.

Daigle,R.J.(2003).Computer attitudes of traditional versus non-traditional accounting students. Fifth Annual Information Systems Educator Association Conference and Faculty Training. Louisiana State University Department of Accounting E.J. Ourso College of Business Administration Baton Rouge, LA 70803-6304 225-578- 6275.rjdaigle@lsu.edu

Divine, R. L., & Wilson, J. H. (1997). Antecedents of student attitudes towards computers. Journal of Marketing Education, 19(2), 54-66.

Garcia,Juan,Coll. (2001). An instrument to help teachers assess learners' attitudes towards multimedia instruction. Education, 122(1).94-101.

Garland, K. J., & Noyes, J. M. (2004). Computer experience: a poor predictor of computer attitudes. Computer in Human Behavior, 20(60), 823-840.

Hashim, H. R. and Mustapha, W. N. (2004). Attitudes towards learning about and working with computers of students at UITM. The Turkish Online Journal of Educational Technology, 3 (2), 1303-6521.

Hunt, N. P., & Bohlin, R. M. (1993). Teacher education students' attitudes towards using computers. *Journal of Research on Computing in Education*, *25*(4), 487-489.

İşman, A., Çağlar, M., Dabaj, F., Altınay, Z. & Altınay, F. (2004). Attitudes of students toward computers. The Turkish Online Journal of Educational Technology – TOJET, 3 (1), Article 2.

Karakaş, A. (2011). Motivational Attitudes of ELT Students towards Using Computers for Writing and Communication. The Journal of Teaching English with Technology, 11(3), 37-53. (2011)

Kay, R. H. (2008). Exploring gender differences in computer-related behavior: Past, present, and future. In T. T.

Kidd & I. Chen (Eds.), Social information technology: Connecting society and cultural issues(pp. 12-30). Hershey, PA: Information Science Reference.

Kerawalla, L. & Crook, C. (2010). Children's computer use at home and at school: context and continuity, *British Educational Research Journal*,*28* (6)751-771.

Kutluca, T. (2011) A Study on Computer Usage and Attitudes toward Computers of Prospective preschool Teachers. International Journal on New Trends in Education and Their Implications: January - March 2011 Volume: 2 Issue:1 ISSN 1309-6249

Lim, E. (2012). Patterns of kindergarten children's social interaction with peers in the computer area, *International Journal of Computer-Supported Collaborative Learning, Online First*, 4 July 2012.

McGrath, D., & Thurston, L. P. (1992). Sex differences in computer attitudes and beliefs among rural middles school children after a teacher training intervention. Journal of Research on Computing in Education, 24(3), 468-490.

McInerney, V., McInerney, D., & Sinclair, K.(1990).Computer Anxiety and Student Teachers: Interrelationships between computer anxiety, demographic variables and an intervention strategy. Paper presented at the AARE Annual Conference The Changing Face of Professional Education., University of Sydney.

McNabb ,M.L.(2005). Raising the Bar on Technology Research in English Language Arts ISTE, 38(1).

Mitra, A. (1998) .Categories of computer use and their relationships with attitudes toward computers. Journal of Research on Computing in Education, 30, 281-95.

Mitra, A., & Steffensmeier, T. (2000). Changes in student attitudes and student computer use in a computer-enriched environment. *Journal of Research on Computing in Education*, *32*(3), 417-434

Mohd D, Chong S, Azizah A, Salwani M, Rafidah K, Ruhana Z (2007). The effects of students' backgrounds and attitudes on computer skills in Malaysia. Inter.J. Manage. Educ. 1 (4): 371-389.

Norzaidi, M.D. and Intan Salwani, M. (2007) Information Technology Management Model: An Introduction, Selangor: University Publication Centre, UiTM.

Sackes, M, Trundle, K & Bell, R. (2011). Young children's computer skills development from Kindergarten to Third Grade, *Computers &Education*, *57*(2), 1698-1704.

Shashaani, L. (1997). Gender differences in computer attitudes and use among college students. Journal of Educational Computing Research, 16(1), 37-51.

Teo, T. (2006). Attitude toward computers: a study of post-secondary students in Singapore. Interactive Learning Environments, 14(1), 17-24.

Theodotou, E. (2010). Using computers in early years education: What are the effects on children's development? Some suggestions concerning beneficial computer practice. A paper presented at *International Scientific Conference "eRA-5": The SynEnergy Forum*. T.E.I. of Piraeus 15-18 September.

Usun, S. and Anafartalar, K. (2004) Important learning dimensions influencing undergraduate students learning and academic achievement in higher education, The Turkish Online Journal of Educational Technology – TOJET October 2004 ISSN: 1303-6521 volume 3 Issue 4 Article 3

Woodrow, J. E. (1987). Educators' attitudes and predispositions towards computers. Journal of Computers in Mathematics and Science Teaching, 6(3), 27-37.

Yaghi, H. (1997). Pre-university students' attitudes towards computers: An international perspective. *Journal of Educational Computing Research*, *16*, 237-249.

Yang, S. C. & Chen, Y. 2007. Technology-enhanced language learning: A case study. Computers in Human Behavior, 23, 860 – 897.

E-Learning Readiness in Medicine: Turkish Family Medicine (FM) Physicians Case

Dr. Alaattin Parlakkılıç
Gülhane Military Medical Academy
Medical Informatics Department, Turkey
apkilic@gata.edu.tr

ABSTRACT
This research investigates e-learning readiness level of family medicine physicians (FM) in Turkey. The study measures the level of e-learning readiness of Turkish FM physicians by an online e-learning readiness survey. According to results five areas are ready at Turkish FM physicians but need a few improvements: *equipment/infrastructure, online learning style readiness, technological skills readiness, cultural readiness, financial readiness.* Three areas are not ready and need some work to improve their readiness: *Human resource readiness, attitude readiness, and environmental readiness.* Finally, the outcomes of e-learning readiness indicate that the Turkish Family Medicine Physicians are ready for adopting e-learning. The overall results show that the e-learning readiness level at Turkish FM physicians has been 68,28 %, and ready but needs a few improvements for e-learning.

Keywords: E-Learning Readiness, Medical Education, Family Medicine Phyisicans,Readiness Level.

INTRODUCTION
Working conditions and office hours are intense for family medicine (FM) physicians in Turkey. By March 2014 that there have been more than 21000 family medicine physicians in Turkey, with more than 3,500 patients per physician. How can training effectively occur when physicians leave their medical center or facility? Under this conditions family medicine physicians may not find opportunities for tradational courses but can attend e-learning courses. Since much of the knowledge acquisition occurs outside of working hours, e-learning is a supportive tool in continuing medical education.

The research aims to investigate e-learning readiness for proposing a successful e-learning design for family medicine (FM) physicians in Turkey. Subsequently, it addresses requirements to implement a successful e-learning system. The research focused on e-learning readiness by a deviced survey instrument from previous studies for the research context; assessing family medicine (FM) physicians e-learning readiness; and identifying factors that need to propose a successful e-learning design.

LITERATURE REVIEW
Health professionals have to update their knowledge in medical sciences, technologies and techniques. This is called continuing professional education (CPE) or continuing medical education (CME). CME is an indispensable part of the working life of physicians and health professionals (Fordis, King,&Ballantyne, 2005).

The use of e-learning enables medical students to engage with high quality teachers and doctors around the world in both real time and at asynchronous learning events (Edward et al.,2006). In medical education, content can be delivered either synchronously or asynchronously. Synchronous delivery refers to real-time, instructor-led e-learning, where all learners receive information simultaneously and communicate directly with other learners. With asynchronous delivery, the transmission and receipt of information do not occur simultaneously. The learners are responsible for pacing their own self- instruction and learning. The instructor and learners communicate using e-mail or feedback technologies, but not in real time. Synchronous content delivery is hard to achieve in medical education without some preconditions needed such as high speed Internet connections, free access to computers and high computer skills of students and teachers (Masic, 2008).

The e-learning readiness dimensions
A number of instruments have been developed to assess e-learning readiness. Aydin and Tasci (2005) developed an E-Learning Readiness Survey (ELRS) to assess how managers perceive their institution's readiness for e-learning in Turkey and to investigate whether managers' demographic characteristics (gender, age, education, and computer experience) differentiate their perception of institutional readiness for e-learning. The study revealed that although the companies surveyed were ready for e-learning overall, to successfully implement e-learning they needed to improve their human resources. The results confirmed that gender, age, education level, and computer experience had no effect on participants' overall perception of institutional readiness.

Abas, Kaur, and Harun (2004 developed an "E-Learning Readiness (ELR) "instrument to assess e-learning

readiness in Malaysia. The study confirmed that enablers and receivers were less ready than policy makers and providers. Financial assistance was required to improve the infrastructure in Malaysia and enablers and receivers need content, technical, and environmental improvements. Tertiary Students' Readiness For Online Learning (TSROL) was developed by Pillay, Irving, and Tones (2007). With this study, *learner preferences, technical skills* and *computer self-efficacy* be improved by adopting a more multidimensional interpretation of the *learning preferences* and *attitudes towards computers.* Sadik (2007) developed an instrument to measure individual readiness to develop and implement e-learning (IRDI-EL). The study revealed that competencies, experience and attitudes affect faculty's individual readiness to successfully develop and implement e-learning approaches. The E-Learning Readiness Self-Assessment (ELRSA) was developed by Watkins, Leigh, and Triner (2004) to assess the readiness of individual learners who have no previous e-learning experience. The researchers claimed *technology access*; *online skills and relationships*; *motivation*; *online audio/video*; *Internet discussions*; and *importance to your success* were reliable from the perspective of learners.

In this study, the e-learning readiness dimensions have been grouped into eight dimensions based on previous researches. The dimensions are as follows:

- **Technological skills readiness:** It refers to the observable and measurable technical competencies involving users' capabilities with computers and the Internet.
- **Online learning style readiness:** It is defined as the readiness of the learner or trainee in terms of time commitment to e-learning, discipline and interest in e-learning and the perception of the status of qualifications obtained via e-learning.
- **Equipment/infrastructure readiness:** This dimension is defined as the right equipment/infrastructure readiness, provision of technical support, e-learning content delivery, and a LMS adopted by the organizations.
- **Attitude readiness:** User attitudes are factors that influence the use of technology. Attitude readiness in this study involves confidence, enjoyment, importance, motivation, self-development, and anxiety.
- **Human resources readiness:** It is the availability and design of the human support system.
- **Environmental readiness:** It involves the readiness of the institution as a whole in terms of government policy, the role of mass media, and intellectual property regulations.
- **Cultural readiness:** It is the use of e-learning in terms of Internet use and networked technologies to disseminate information, communication, interaction and teaching.
- **Financial readiness:** This concept refers to whether a learner/trainee or an institution is financially ready for e-learning programs.

METHOD

The research employed a quantitative method based on survey. Data was collected through an e-learning readiness survey. To measure e-learning readiness, the study proposes eight dimensions of readiness drawn from the literature review: (1) *technological skills readiness*; (2) *online learning style readiness*; (3) *equipment /infrastructure readiness*; (4) *attitude readiness*; (5) *human resource readiness*; (6) *environmental readiness*; (7) *cultural readiness*; and (8) *financial readiness*. The questionnaire was divided into three sections: A, B, and C. Section A: Demographic–contains five questions to collect demographic characteristics from the individuals including age, gender, education level, the institution they belong to, and their position in the institution. Section B: Communication issues – contains four questions to collect individuals' communication and internet access information. Section C: E-learning readiness dimensions.

RESULTS

Online survey was administered to the physicians of Turkish FM. Online survey was administered to the physicians of Turkish FM and a total of 1172 family physicians,71.8% of the men and 28,2% women, attended to survey 87.8% physicians are married. This section addresses the level of readiness for Family Medicine Physicians in Turkey in each dimension, and identifies critical factors that need to be considered in order to implement successful e-learning framework.

The assessment of readiness in this study was developed based on an process used by Aydin and Tasci (2005). A five-point Likert scale in which each answer was coded into 1, 2, 3, 4, and 5 therefore the critical level was 0.8 (4 intervals divided by 5 categories) considering 66,64 (3.4) as the expected level of readiness. Table1 presents the percentages of e-learning readiness for implementing Family Medicine Physicians in Turkey. The level of readiness in each dimension was assessed individually. Three areas are not ready and need some work to improve their readiness: *Human resource readiness, attitude readiness, and environmental readiness.*

Table1.E-learning readiness of Turkish FM Physicians

Equipment/infrastructure readiness	% 77,64
Online learning style readiness	% 75,13
Technological skills readiness	% 74,47
Cultural readiness	% 73,81
Financial readiness	% 73,26
Human resource readiness	% 65,86
Attitude readiness	% 64,22
Environmental readiness	% 52,6
Overall Readiness	% **68,28**

Technological skills readiness: Technological skills readiness refers to observable and measurable technical competencies. Previous studies indicate that this dimension is very important for adopting e-learning (Abas, Kaur, & Karun, 2004; Aydin &Tasci, 2005; Chapnick,2000; Pillay et al., 2007; Sadik, 2007; Watkins et al., 2004). The results show that the level of technological skills readiness at Turkish FM was ready at 74,47%, and ready but needs a few improvements for readiness.

Online learning style readiness: Online learning style readiness involves learners' readiness in terms of time commitment to e-learning, discipline and interest in e-learning, and perception of the status of qualifications obtained via e-learning. Previous studies considered this dimension to be important (Pillay et al., 2007; Watkins et al., 2004). The results show that the level of online learning style readiness at Turkish FM was ready at 75,13%, and ready but needs a few improvements for readiness

Equipment /Infrastructure readiness: Infrastructure/equipment readiness refers to the provision of technical support, e-learning content delivery, broadband facilities, and a Learning Management System (LMS) by the institutions who adopt the systems. Connectivity and physical communications infrastructure are the foundation of electronic-readiness for family medicine (EIU & IBM, 2008). The results show that the level of infrastructure/equipment readiness at Turkish FM was ready at 77,64%, and ready but needs a few improvements for readiness.

Attitude readiness: Attitude readiness involves confidence, enjoyment, importance, motivation, self development,and anxiety. Attitude readiness ranked at 64,22%, indicating that it is not ready but needs some work and improvements. Previous studies noted that attitude directly affects individual readiness for e-learning (Aydin &Tasci, 2005; Pillay et al., 2007; Sadik, 2007;Watkin et.al.,2004).

Human resource readiness: Human resources readiness is the availability and design of the human support system including management (having a vision/mission or formulated policies related to the provision of e-learning and the institutional recognition of qualifications obtained via e-learning) and personnel. The results show that the level of human resources readiness at Turkish FM was ready at 65,86%, and not ready needs some work for readiness. This dimension is vital (Abas, Kaur, & Karun, 2004; Aydin &Tasci,2005;Sadik,2007).

Environmental readiness: Environmental readiness refers to the level of readiness of a society/nation for e-learning as perceived by stakeholders (policy makers, providers, enablers, and learners/trainees) from within and outside the institution, and involves the readiness of the institution as a whole in terms of government policy, the role of mass media, and intellectual property regulations.The results show that the level of environmental readiness at Turkish FM was ready at 52,6%, and not ready and needs some work for readiness.

Cultural readiness: Cultural readiness refers to acceptance of Internet use and network technologies as a mode for information dissemination, communication, interaction, and teaching; and the readiness for making e-learning a way of life in their institution. Culture towards significantly affects implementation. The results show

that the level of cultural readiness at Turkish FM was ready at 73,81%, and ready but needs a few improvements for readiness.

***Financial readiness*:** Financial readiness refers to the ability to afford the required equipment and facilities for e-learning implementation as perceived by policy makers, enablers, and learners/trainees. The level of readiness on financial readiness was a low 73,26% indicating that it was moderately ready and people can afford and ready but needs a few improvements for readiness**.**

CONCLUSION

The level of readiness in each dimension was assessed individually. According to results five areas have been seen that are ready but need a few improvements. These areas are equipment/infrastructure readiness, Online learning style readiness, Technological skills readiness, cultural readiness, and Financial readiness. Three areas are not ready and need some work to improve. These areas are Human resource readiness, Attitude readiness, and Environmental readiness. The results show that the level readiness at Turkish FM was ready at 68,28 %, and ready but needs a few improvements for e-learning readiness. With this study, the e-learning readiness requirements were updated and implemented for family medicine physicians comprehensively.

ACKNOWLEDGEMENTS

I would like to thank for the scholarship granted to me by **The Scientific and Technological Research Council of Turkey** (*Türkiye Bilimsel ve Teknolojik Araştırma Kurumu*, **TÜBİTAK**).This study is one of the outcomes of my study as a post doctorate scholar in the University of Missouri-Kansas City in USA.

REFERENCES

Abas, Z.W., Kaur, K. &Harun, H. (2004). E-learning Readiness in Malaysia 2004. A Join Study by the Ministry of Energy, Water and Communications Malaysia and Open University Malaysia

Aydin, C.H. &Tasci, D. (2005). Measuring readiness for e-learning: Reflections from an emerging country. *Educational Technology & Society, 8*(4), 244-257.

Chapnick, S. (2000). Are you ready for e-learning? *Learning Circuits: ASTD's Online Magazine All About ELearning.* Retrieved September 23,2014 from http://www.learningcircuits.org/2000/ nov2000/Chapnick.htm

Edward, H.,&Shortliffe, E.,&Leslie, E.,&Perreault,E.(2006). Medical informatics computer application in health care andnbiomedicine. Springer, 3rd edition, 623-4.

Economist Intelligence Unit Limited & IBM Corporation. (2008). E-readiness rankings 2008: Maintaining momentum. Retrieved October 10, 2014 from http://a330.g.akamai.net/7/330/ 25828/20080331202303graphics.eiu.com/upload/i bm_ereadiness_2008.pdf

Fordis, M., King J,E., Ballantyne, C.,M (2005). Comparison of the instructional efficacy of Internet-based CME with liveinteractive CME workshops: a randomized controlled trial. J Am Med Assoc 2005; 294:1043–1051.

Masic I. (2008).E-Learning as New Method of Medical Education. Acta Inform Med. 2008;16(2):102–117.

Pillay, H., Irving, K., & Tones, M. (2007). Validation of the diagnostic tool for assessing tertiary students' readiness for online learning. *Higher Education Research & Development, 26*(2), 217-234.

Sadik, A. (2007). The readiness of faculty members to develop and implement ELearning: The case of an Egyptian university. *International Journal of ELearning, 6*(3), 433-453.

Watkins, R., Leigh, D., &Triner, D. (2004). Assessing readiness for e-learning. *Performance Improvement Quarterly, 17*(4), 66-79.

Evaluation of a Digital Story Pedagogical Module for the Indigenous Learners Using the Stake Countenance Model

T. Vanitha Thanabalan
English Language Teaching Centre, Kuala Lumpur, 50603 Malaysia

Saedah Siraj
Department of Curriculum and Instructional Technology, Faculty of Education, University of Malaya, Kuala Lumpur, 50603 Malaysia
saedah@um.edu.my

Norlidah Alias
Department of Curriculum and Instructional Technology, Faculty of Education, University of Malaya, Kuala Lumpur, 50603 Malaysia
drnorlidah@um.edu.my

ABSTRACT
This study involved the development of a literacy pedagogy for the indigenous people in Malaysia. The Developmental Research Approach was used where insights about the indigenous people and their lifestyle were gathered and analysed for content in developing a literacy pedagogical module. Several principles emerged from the data collected and these principles formed the basis for the module. The module encompassing a digital story was implemented in two schools for indigenous students situated in Peninsular Malaysia. The Stake Countenance model was used to analyse and conclude the evaluation of the module. Both teachers and students who participated in the module implementation were directly involved in the evaluation process. Findings showed that there was strong engagement between the Indigenous students and the lessons in the module. The teachers found that the module was able to respond to the needs of the indigenous students. This paper will discuss the evaluation process in detail and present the findings with reference to educational needs of the indigenous students in the country as a whole.

Keywords: Responsive Pedagogy; Indigenous Learners; Literacy pedagogy; Developmental Research Approach.

INTRODUCTION
Literacy practices among children today are embedded in textual environments which are complex (Healy, 2002). This is due to the dynamic development of multi-literacies and multimodalities which have a profound impact in the lives of young children today. Text is no longer associated with written messages and symbols alone. Transformation in digital technologies has expanded the definition of text to include various other multi modal features (Larson, 2009). Research in the area of literacy and technology indicates that there is significant difference in the way readers approach digital texts as compared to printed texts (Bailey, 2006, in McVee, Bailey, & Shanahan 2008; Healy, 2002; Tseng, 2008). This is attributed to several reasons; first, the textual artefacts and accompaniments of digital technology make a difference to the ways in which text is read (Healy, 2002). Healy explains that electronic texts are composed of info-graphic structure with the integration of image, sign, and audio. This makes the text rich and non-linear in structure which also requires the reader to use multiple strategies when reading. Next, meanings in multimedia text are not fixed and additive (the word meaning plus the picture meaning) but multiplicative (word meaning modified by image context, image meaning modified by textual context), making the whole far greater than the simple sum of its parts (Bailey, 2006, in McVee et al., 2008).

Given this development in literacy, there is a great implication on literacy pedagogy. ELT methodology has to embrace this development or face the risk of being irrelevant to a society made up of different layers of communities whose cultures and life experiences differ from one another. In Malaysia, the indigenous group is a particular community that is of concern for the government. It has been noted that the literacy level and learning achievement among the Indigenous children is low in Malaysia (UNICEF Malaysia, 2008). The illiteracy rate among the Indigenous children is also alarming. Redzuan and Gill (2008) reported that the illiteracy rate among this group is 49.2% compared to 6.4% at the national level. Another serious problem of the Indigenous people is the high dropout rate. About 62% of Indigenous children drop out of school every year and 94.4% do not complete secondary school (Kamarulzaman Kamarudin & Osman Jusoh, 2008). The percentage of passes among the Indigenous children in Year 6 is between 43% to 59% compared to 78% at the national level. This calls for serious attention and the government of Malaysia has taken several initiatives in addressing the issue.

The Ninth Malaysia Plan for example focuses on the effort to address gaps in access, equity and quality of education especially among vulnerable groups such as the Indigenous children. The National Education Blueprint 2013-2025 has specified various efforts to provide equal facilities and education to both rural and urban schools. It is crucial that steps are taken to improve the standard of education among the Indigenous students. One such effort is to look at ways to increase their literacy by making reading materials effective and relevant to their context. This paper discusses an initiative to design a literacy pedagogy to facilitate literacy among indigenous learners. This paper will present findings from a research carried out with a group of indigenous people in Malaysia. The Developmental Research Approach was used where insights about the indigenous people and their lifestyle were gathered and analysed for content in developing a literacy pedagogical module. Several principles emerged from the data collected and these principles formed the basis for the module. The module encompassing a digital story was implemented in two schools for indigenous students situated in Peninsular Malaysia. The Stake Countenance model was used to analyse and conclude evaluation of the module. Both teachers and students who participated in the module implementation were directly involved in the evaluation process. Findings showed that there was strong engagement between the Indigenous students and the lessons in the module. The teachers found that the module was able to respond to the needs of the indigenous students. This paper will discuss the evaluation process in detail and present the findings with reference to educational needs of the indigenous students in the country as a whole.

Theoretical Framework

The present study was guided by the schema theory. The schema theory describes comprehension as a process of interaction between the text and the reader's background knowledge (Carrel & Eisterhold, 1983). Carrel and Eisterhold (1983) argued that text by itself does not bring meaning but it is the reader who relates the text to the existing acquired knowledge to construct meaning.

Text comprehension as a process is based on the principle that every input is mapped against some existing schema which should be compatible with the input. The schema or schemata is organized from the most general at the top to the most specific at the bottom. This organization helps to explain the two modes of information processing: bottom-up and top-down processing. Bottom-up processing involves the bottom level schemata and the incoming data. This stage is called data-driven. The top-down processing involves higher level general schemata where the system makes general predictions and searches for more detailed information from the specific schema to fit in the general idea. This stage of processing is called conceptually driven. Both the bottom-up and top-down should be occurring at the same time, one facilitating the other.

Brown (2001) describes two types of schema; content schema and formal schema. Content schema includes knowledge about people, the world, culture and the universe. Formal schema is knowledge about the discourse structure. Content schema refers to understanding of the text and the cultural elements needed to interpret it. This cultural element is a major aspect that influences the understanding of a text (Carrell, 1983, in Ahmad, 2006). Carrell suggests that reading teachers should ascertain that the reading text matches the student's culture. The reading material should activate the student's schema and this leads to understanding of the text.

In view of the schema theory, Coady (1979) in Carell et al. (1996) described reading as an interpretive process. Coady explained how the reader's background knowledge interacted with their conceptual abilities and process strategies in comprehending the text. Conceptual abilities refer to the general intellectual ability while processing strategies refer to language processing skills including lexical meaning, syntactic information and contextual meaning. Background knowledge according to Coady will help the reader to comprehend better and involve the reader in the text. Readers are able to understand better because they can take the text beyond its graphic representation and assign the task to the knowledge and concepts already stored in the memory. This is further supported with the attitude and beliefs the readers bring to the text. Therefore, Coady suggested that the linguistic ability together with the knowledge of the world enables the reader to comprehend the text. This interaction can be seen in Figure 1.

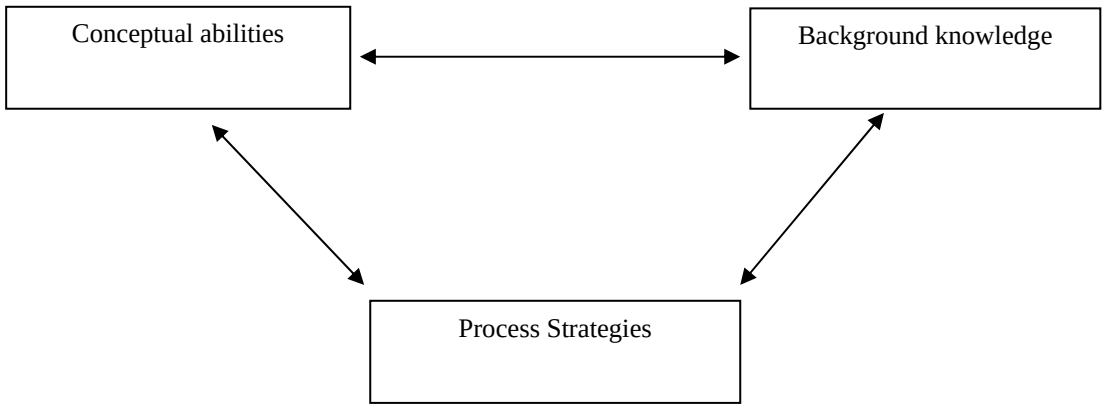


Figure 1. Coady's (1979) model of the ESL Reader.

Content knowledge of a second language learner is often culture-specific (Carrell & Eisterhold, 1983). Thus, it is important to provide text familiar to the learner and to which the learner can relate. One method of maximizing learners' cultural schema is by using the students' own ideas and words in the reading text as proposed by the Language Experience Approach (Rigg, 1981, in Carrell & Eisterhold, 1983). The other method is by developing reading material with the local settings and specialized low frequency vocabulary. This method is important for learners with low proficiency who need facilitation in vocabulary. Finally, previewing is another activity that helps to activate the prior knowledge (Carrell & Eisterhold, 1983). Showing familiar pictures and vocabulary, for instance, helps the reader in understanding the text.

McVee, Dunsmore, and Gavalek (2005) reviewed the influence of cultural perspectives on learners' schema. Reviewing the work by Bartlet (1925), McVee et al. pointed out that one's schema or understanding of the world is formed through transactions with the outside world. This transaction includes the cultural practice of the learners. However, McVee et al. reported that in most studies based on schema theory, the importance of culture and the transaction process were not given attention. In fact, schema is defined as formed within individuals, in the head (McVee et al., 2005, p. 556). In explaining the origin of schema, McVee et al. stressed that schemas or cognitive structures emerge or transform as a result of transactions with the world through material and ideational means. Thus, culture and social aspects of the learners are important elements that constitute the schema of the individual learner. The present study which was aimed at developing a digital story (DS) pedagogical module to facilitate reading was designed based on principles related to the schema theory. Context of the learners which included their experience and culture were important elements in developing the module. The content of the digital story was based on insights from the context of the learners. Reading activities in the module were also designed based on the context and experiences of the learners. This was to enable the students to draw on their background knowldege or schema in comprehending the text.

METHODOLOGY

The purpose of this study is to develop a DS pedagogical module with the aim of facilitating reading comprehension among a group of Orang Asli primary school students. The study adopted the Developmental Research design which has a clear outline of design strategies, systematically divided into several phases. Van Den Akker (1999) has outlined three major stages in the developmental research approach. First is the analysis phase which involves preliminary investigation. This includes reviewing literature in a particular area, consulting experts and carrying out case studies on current practices to gain better understanding of the needs and concerns in the context concerned. The second phase is the design and development stage which involves systematic efforts to explain the theoretical background and research for the research design. This is followed by the third phase, the implementation and evaluation stage. This phase requires a search for evidence of the practicality and effectiveness of the intervention on a target group in a particular setting. In the present study, phase 1 involved inquiry into the needs of the Orang Asli students in relation to reading comprehension in the English language. The participants in the needs analysis phase were ten English language teachers from Orang Asli schools. Classroom observations were carried out to gain information on the current pedagogy in reading comprehension as well as to identify the needs of the Orang Asli students with regard to reading comprehension. Phase 2 was the design and the development phase where the DS pedagogical module was designed and developed. This involved interviews with experts from various related fields such as from the Orang Asli context, the teaching of English language and the use of technology in education. Observation of everyday events in the context of the Orang Asli community were also were integrated in the module. Upon completion of the module development, a team of experts reviewed the module. Finally phase 3 was the module implementation and evaluation. The

module was implemented in two contexts with the same population of Orang Asli, the Temuan community. The Stake Countenance model was used to evaluate the module.

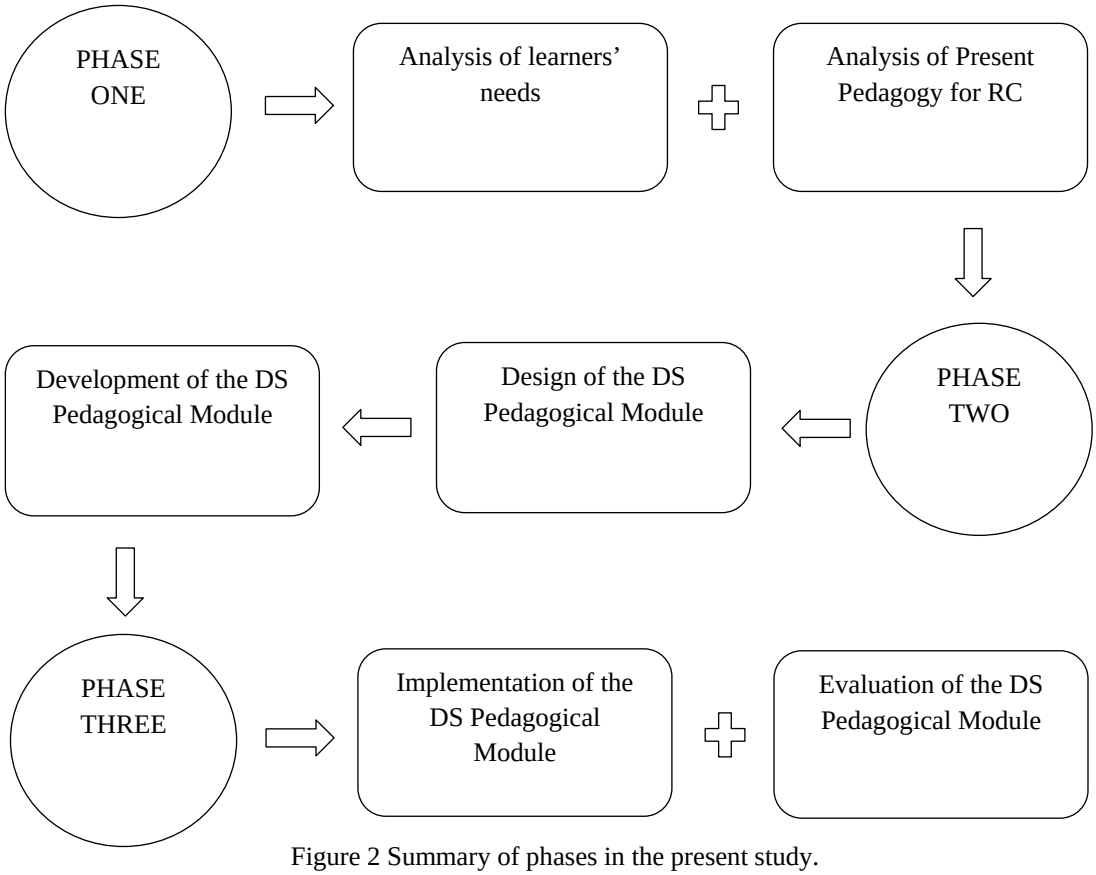


Figure 2 Summary of phases in the present study.

Research Questions

The research questions which guided the third phase of the study were:

1. What is teachers' evaluation of the DS pedagogical module according to the Stake Countenance model?

a) What are teachers' expectations of the DS pedagogical module before its implementation?
b) What are teachers' opinions of the DS pedagogical module after its implementation?
c) What is the congruence between teachers' expectations before the implementation of the module and teachers' opinions after implementation?

Description of the Stake Countenance Model

The Stake Countenance model is often used as a framework for evaluation. This model involves two major operations or countenances which is complete description and judgement of the program. The Stake model provides a framework for evaluators in collecting, organizing and interpreting data. The framework has three components which are antecedent, transaction and outcome. Antecedent is the condition existing prior to instruction. Transactions refer to successive engagements in the process of instruction and outcomes are the effects of instruction. The present study was evaluated based on this model where two teachers were interviewed before and after the module was implemented. An analysis of congruence between the two phases of interviews was carried out to obtain judgement regarding the use of the module in facilitating reading comprehension. Description of the lessons through observations as well as student response was done and this explained the transaction process as depicted in the model. Figure 3 is a description of the Stake Countenance Model used in the present study.

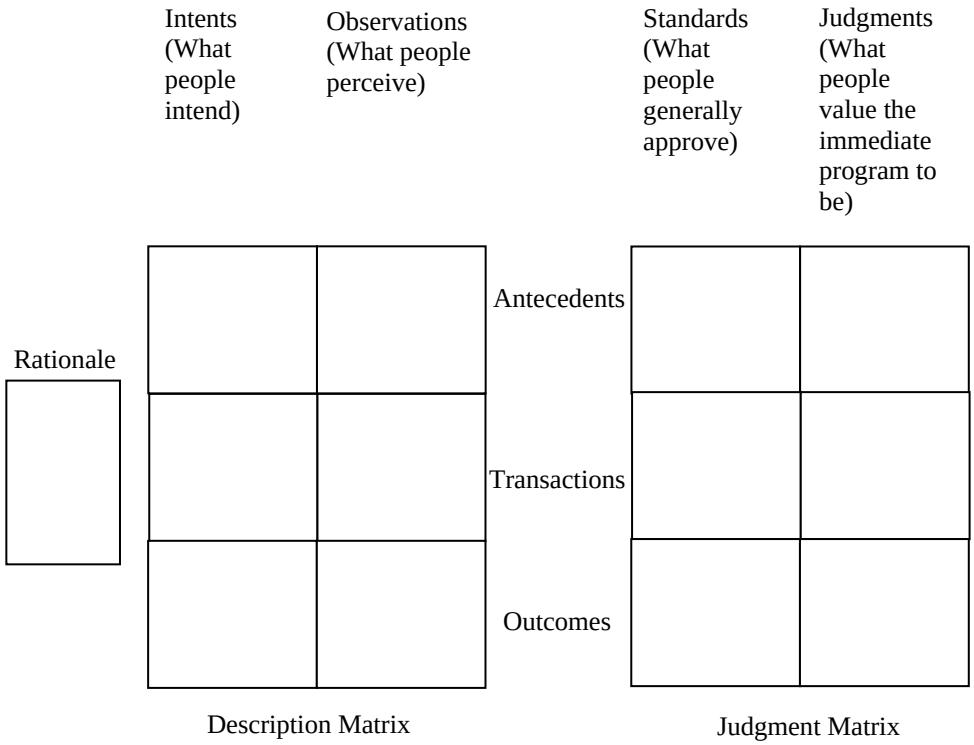


Figure 1.2. Stake's Format for Collecting Data to be used in evaluating an Educational Program.

The Stake Countenance Model is appropriate for the present study because the model provides space for description that reflects the fullness, the complexity and the importance of a program (Stufflebeam & Shinkfield, 1985). This description is necessary to evaluate the usability of the DS pedagogical module.

Findings from the evaluation phase using the Stake Countenance Model

The evaluation phase consisted of interview sessions which were categorized into six aspects: reading text, content, language, comprehension strategy, comprehension task and teaching as well as learning instruction. There were two rounds of interviews: the first round was conducted as antecedent data while the second round was after the transaction where the module was implemented. This section discusses the analysis of congruence between teachers' expectations before and after the module implementation.

Teachers' expectations before implementation of the DS pedagogical module

Interview sessions were carried out with both teachers from context A and B to seek information on their expectations and views of the DS pedagogical module. The teachers' expectations were analyzed according to five **c**ategories found in the DS pedagogical module which were:

i) Type of text
ii) Content of the module
iii) Language
iv) Reading comprehension strategy
v) Reading task

The following Table 1 describes the findings before and after the module implementation.

Table 1: Teachers' Views Before and After Module Implementation

Categories	**Teachers' expectation of the module before the implementation of the module.**	**Teachers' views after the implementation of the module.**
Type of text	In the form of a story In the electronic medium Should have a lot of colorful pictures. The story should have illustrations to aid comprehension. Should have digital effects such as sound effects, 3D effects and authentic material.	text of the digital story was interesting and relevant to the students in the context of the study. text had been presented in an interesting manner.

Content	The themes should be related to the Orang Asli life. Should include some cultural elements which reflected the context of the Orang Asli community. The setting should be like their home. Should include songs and music.	uitable and relevant to the students the story as realistic and within their context. the content was context specific and the students were able to make connection with the text. cultural element in the digital story which was related to the Orang Asli way of life the culture of staying in the jungle for a period of time to find things. This culture could be seen in the digital story. subject about their culture helped the students in understanding
Language	Should be simple and relevant to the context of the Orang Asli students. The vocabulary should be at lower level. The dialogue should be a mix of English language, Bahasa Melayu and the Temuan language. The sentences should be in the simple form and not too complicated.	The language was simple and the students were able to understand the story The meanings had been translated into their language. This facilitated the understanding. Language was simple. The students could understand the story.
Reading Comprehension Strategy	There should be a lot of repetition. There should be some use of translation.	There was a lot of repetition. The students could remember the story well.
Reading Comprehension Task	The task should be interesting and relevant to their needs. The task should also emphasize a lot of repetition. The text should have reading task in the form of games and activities. Interactive activities using the computer will be good.	The activities were relevant and useful in helping the students in comprehending the text. The students could respond very well on the task A lot of activities, interactive and related to the text and students were able respond well. Instructions for the teaching and learning activities were clear. The bamboo task was connected to their lifestyle. There was a difference in the way the students responded to the lesson…they were active and interested.

An analysis of the congruence between the expectations before the implementation and teachers' opinion after the DS pedagogical module was implemented in the two schools was done. Analysis was focused on the same five areas: type of text, content, language, comprehension strategy and comprehension task. Table 2 presents the analysis of congruence on teachers' expectation related to comprehension text before implementation and teachers' opinion after the implementation of the DS pedagogical module.

Table 2: Congruence from the Comprehension text aspect.

Component in DS pedagogical module	Expectation fulfilled	Expectation not fulfilled
Comprehension Text	Genre : Story Medium : electronic Layout: colourful and interesting, sound effects and music included.	none

The text, as expected by the teachers, had the all the aspects mentioned. The teachers pointed out that the text was suitable for the students and they were attracted to the story. In this case, teachers' expectation of the text was fulfilled. Table 3 presents an analysis of congruence on teachers' expectation related to the content of the digital story before implementation and teachers' opinion after implementation of the DS pedagogical module

Table 3: Congruence from the Content Aspect

Component in DS pedagogical module	Expectation fulfilled	Expectation not fulfilled
Content of the digital story	- Realistic and within the context of the Orang Asli students. - Cultural elements present. - Setting was natural. - Reflected the Orang Asli way of life and their daily experiences. -Students able to relate their experiences with the text. - Students able to comprehend the text.	none

Teachers' expectations of the content were fulfilled in the DS pedagogical module. The digital story was on the whole context specific and the students were able to connect to the story. Thus the digital story was suitable and relevant for the students.

Table 4: Analysis of Congruence on Language Aspect in the Digital story before and after DS pedagogical module implementation

Component in DS pedagogical module	Expectation fulfilled	Expectation not fulfilled
Language	- Simple vocabulary and sentence structure. - Use of Temuan language in the dialogues was useful.	none

The language expectation of the teachers in the DS pedagogical module was also achieved. The vocabulary and sentence structure were simple and within the students' ability.

Table 5

Congruence from Comprehension Strategy Aspect Before and After Module Implementation

Component in DS pedagogical module	Expectation fulfilled	Expectation not fulfilled
Comprehension strategy	- Use of repetition was useful for the students. - Translation of vocabulary to Temuan language aided comprehension. - Presentation of the DS such as colourful illustrations, sound effects and music facilitated comprehension.	none

The next component which was the comprehension strategy in the module also met the teachers' expectation. The teachers were satisfied with the use of repetition and the translation into the Temuan language which they viewed as useful for the students in understanding the text. They also were of the opinion that the digital story had many support structures in term of its layout.

Table 6: Congruence Related to Reading Comprehension

Component in DS pedagogical module	Expectation fulfilled	Expectation not fulfilled
Reading comprehension task	- Simple and interesting task - Students could relate their experience with the task. - Interactive. - Within their knowledge and experience so students could respond.	none

Similarly, the reading task in the DS pedagogical module was within the teachers' expectations. The students were able to respond to all the tasks and thus they were able to comprehend the digital story.

Table 7: Congruence with Respect to Teaching and Learning Instructions

Component in DS pedagogical module	Expectation fulfilled	Expectation not fulfilled
Teaching and learning instructions in the DS pedagogical module	- Clearly written and easy to follow. - Teachers could follow the instructions without difficulty. - Complete with lesson plans and suggested comprehension activities.	none

The teachers were satisfied with the instruction for both teaching and learning activities in the DS pedagogical module. The teachers' expectations with regard to the written instructions as well as lesson plans and comprehension activities were fulfilled.

In summary, based on the analysis of congruence on the teachers' expectations before and their opinion after the implementation of the module, it was clear that all the expectations of the module were fulfilled.

IMPLICATIONS OF THE STUDY

1) Material production for Orang Asli primary school students.

Indigenous students learn better with indigenous material. Rushton (2007) proposed this notion after working with several cases of indigenous students in New Zealand. The reading text was based on the cultural context of the indigenous students and this improved students' learning. Rushton concluded that familiarity of a text is important as it gives the learners opportunity to participate and understand better.

'Familiarity' is a concept related to the schema of the learners and research has proven the positive role of learners' schema or background knowledge in reading comprehension (Ahmad 2006; Brown, 2001; Carrell et al. 1983 & Holliday,1997). The content schema of a learner includes knowledge of the learners' context and experience. In reading comprehension, this knowledge must be activated and the reading text has to allow this to happen. Therefore, content of the text should be related to the learners' background knowledge. In the present study, the reading text was designed based on the Temuan students' context which included their environment, experiences and issues. The digital story has the forest and their environment as the bigger theme as well as how they lived close with nature. When they were given a reading task based on the use of bamboo, the students were able to relate so much of information as bamboo hunting was part of their cultural experience. This experience is part of their schema and it facilitated their response.

Apart from the content, the language was carefully used to facilitate their understanding of the text. Simple sentences and vocabulary from the context are used in the story. Furthermore, the Temuan language at word level was also included to aid meaning. All these elements of language as suggested by the experts were integrated in the DS pedagogical module to facilitate comprehension of the digital story. Findings from the evaluation of the module do show that the students were able to comprehend the digital story. As such, it is important that reading text for the indigenous students should be designed based on their context. The content and the language should cater for their level of proficiency and their needs. Though it is necessary to prepare them for the public examinations, they should be prepared with the basic reading skills. For this, as a take-off ground, the reading text should be based on their own context so that they can draw on from their experiences in making sense of the text.

2) The need for a culturally responsive pedagogy.

A culturally responsive pedagogy recognizes cultural knowledge, prior experiences and values of the community concerned (Jazadi, 2003 &Johnson, 2011). It has the learner's context and experience playing a central role in the learning process. Research in this area has proven that instruction through responsive pedagogical model has positive impact on students' knowledge and skill (Allen et al., 2002& Janzen, 2009). The present study has involved not only the context of the Temuan students in the digital story, the students themselves have played the role of some of the characters in the story. This participation has created excitement and motivation among the students during the reading lessons. As noted by the teacher, the students were able to understand the reading text because they were part of the story and the context was familiar to them.

Hence, it is important for the Ministry of Education to give serious consideration in planning responsive pedagogy for the Orang Asli students in the country. There are 18 sub-ethnic groups in the country. Each group should have their own pedagogy that relates to their context in term of language, culture and life experiences. The ministry should ensure that responsive pedagogy is made part of the curriculum for the teacher training

program. Teachers should be exposed to the indigenous community and their cultural practices so that effective instruction can be developed to match the needs of the indigenous learners.

3) Digital text to facilitate comprehension.

Meaning making in a multi modal text involves more than words; a variety of semiotic structures such as the visual, auditory and kinesthetic is needed (Eisner, 1985 in Sithamparam, 2005). Sithamparam, 2005 also suggested that alternative forms of representation should be used to aid the meaning making process in a text. A digital text has positive impact on learners' involvement in the reading process (Gordon,2009; Grabe,1996 & Grabinger,1996).

In this study, a digital text was designed to teach reading and the findings show that the Temuan students enjoyed reading the text as well as were able to comprehend the story. The students mentioned that they liked reading the story as they could see the character climbing trees, swimming, playing and so forth. The story was presented as a movie with narration and music as well as sound effects. This caught the students' attention. They were able to recapture the story with the details in the reading task. In short, the story which was presented in the digital form had successfully gained the students' attention in the reading lessons. Thus, as this study has proven, more digital text should be designed to teach reading. Effort should be taken to include multiple forms of structures in ways that can facilitate comprehension.

CONCLUSION

This research has proven that a culturally responsive pedagogy recognizes cultural knowledge, prior experiences and values of the community concerned. The learner's context and experience play a central role in the learning process. The present study involved the indigenous learners and community as a major part of the content creation. This participation created excitement and motivation among the learners. The use of the Stake Countenance Model to evaluate the DS module was most appropriate and accurate in capturing teachers' needs and expectations. The evaluation process was conducted systematically and analysis of findings was managed appropriately. It is highly recommended that other impact study specifically in the education field utilizes the Stake Countenance model.

REFERENCES

Ahmad Al-Issa, (2006). Schema theory and L2 reading comprehension: Implications for teaching. *Journal of college teaching and learning, 3*(7), 41-47.

Brown, J. (2001). The top-down reading of schema theory. http://www.docstoc.com/docs/130605872/Schema-Theory-Background-and-Knowledge-in-Reading

Carrell, P. L., & Eisterhold, J.C. (1983). Schema Theory and ESL Reading Pedagogy. In P. L.

Healy,A. (2002). Digital reading pedagogy for novice readers. http://eprints.qut.edu.au/963/1/Dooley_digital.pdf

Gordon, J. P. (2009). *A case study of a first grade meaning making in a technology rich environment*. Retrieved from ProQuest database.

Grabe, W. (1996). Reassessing the term "interactive". In P. L. Carrell, J. Devine & D. E. Eskey (Eds.), *Interactive approaches to second language reading* (pp. 56-66). New York, NY: Press Syndicate of the University of Cambridge.

Grabinger, R. S., & Dunlap, J. C. (1996). In D. Squires, Can multimedia support constructivist learning? *Journal of Teaching Review, 4*(2).

Holliday, A. (1997). *Appropriate methodology and social context*. New York, NY: Cambridge University Press.

Janzen, J. (2007, December). Preparing teachers of Second Language Reading. *TESOL Quarterly, 41*(4), 707-727.

Jazadi, I. (2003). Mandated English Teaching Materials and their implications to teaching and learning: The case of Indonesia. In *Methodology and materials design in language teaching*. Singapore: SEAMEO regional language centre.

Kamarulzaman, K., & Osman, J. (2008). Educational policy and opportunities of Orang Asli: A study on indigenous people in Malaysia. *The Journal of Human Resource and Adult Learning, 4*(1), 86-97.

Larson, L. C. (2009). E-Reading and e-Responding: New tools for the next generation of readers. *Journal of Adolescent and Adult Literacy*. ProQuest database.

McVee, B., Dunsmore, K., & Gavelek, J. R. (2005). Schema Theory revisited. *Review of Educational Research, 75*(4), 531-566. Retrieved from http//ver.aera.net

Redzuan, M., & Gill, S. (2008). *Orang Asli: Isu, transformasi dan cabaran*. Serdang, Malaysia: Universiti Putra Malaysia.

Richey, R. C., Klein, J. D., & Nelson, W. A. (2002). Developmental Research: Studies of Instructional Design and Development. Retrieved from http://www.aect.org/edtech/41.pdf

Rushton, K. (2007). The significance of text in the teaching of reading in the early years. In Alyson Simpson (Ed.), *Future Directions in Literacy: International Conversations Conference 2007* (pp. 256–268). Sydney, Australia: University of Sydney Press.

Sithamparam, S. V. (2005). The changing landscapes of Children's literacies. In S. Saedah, A. H. Quek, A. Mahzan., & E.S.G. Daniel (Eds.), *Cognition and learning: Issues and strategies*. Shah Alam, Selangor: Malindo.

Stufflebeam, D. L., & Shinkfield, A. J. (1985). *Systematic evaluation*. Hingham, MA. Kluwer-Nijhoff.

Tseng, M. (2008). Comparing EFL learners' reading comprehension between hypertext and printed text. *CALL EJ Online*, *9*(2). http://www.tel.is.ritsumei.ac.jp/callejonline/lournal/9-2/tseng.html

Van Den Akker, J. (1999). *Principles and methods of development research*. In J. van den Akker, R. M. Branch, K. Gustafson, N. Nieveen, & T. Plomp (Eds.), *Design approaches and tools in education and training*. Norwell, MA: Kluwer.

UNICEF Malaysia (n.d.). Folklore to Improve children's literacy. Retrieved from www.unicef.org/malaysia/media_7099.html

Factors Contributing Pre-School Trainees Teachers Adoption of Virtual Learning Environment: Malaysian Evidence

Prof. Dr. Ibrahim Mamat
Universiti Sultan Zainal Abidin (UNISZA), Terengganu, Malaysia
mibrahim30@gmail.com

Ahmad Shidki Mat Yusoff
Institut Pendidikan Guru Kampus Sultan Mizan (IPGKSM), Terengganu, Malaysia
shidkiyusoff@gmail.com

Prof. Dr. Wan Salihin Wong Abdullah
Universiti Malaysia Terengganu (UMT), Terengganu, Malaysia
salihin@umt.edu.my

Fahmi Zaidi Abdul Razak
Universiti College Shahputra, Pahang, Malaysia
fahmizaidirazak@gmail.com

ABSTRACT
Virtual Learning Environment (VLE) has become the main mechanism in supporting on-line education either in primary or secondary school. Although VLE efforts are considered to be a significant corporate investment, many surveys indicate high drop-out rates or failures. This research uses an integrated model in order to assessing the influence of IS-oriented, psychological and behavioral factors on instructors' adoption of virtual learning systems. Survey data collected from 76 pre-school teachers were analyzed using structural equation modeling to examine the theoretical model. The research results show that, perceived ease of use and compatibility increase pre-school teachers intention to use virtual learning systems; however, perceived ease of use is the most important factor affecting on intention and actual use of the system (adoption).

Keywords: Virtual Learning Environment, Intention to use, Partial Least Square, Unified Theory Of Acceptance and Use Of Technology (UTAUT), Technology Acceptance Model (TAM) and Compatibility

INTRODUCTION
The move from a product-based economy to a knowledge-based economy results in an better demand for knowledge workers (Lai, Wang, & Chou, 2009; Ong & Lai, 2007; Ong, Lai, & Wang, 2004), so that education institutions with limited facilities are not able to fulfill this need. Therefore, beside traditional training, they have turned to offer electronic courses. Education institutes and companies have devoted great efforts and large sum of money to develop e-learning programs for users. Surveys conducted by the Ministry of Education in 2010 found that the use of ICT in school is limited. Approximately 80% of teachers use ICT less than one hour per week. Only a third of students stated their teachers regularly use ICT. Ministry of Education Malaysia (2012) in the preliminary report of Malaysia Education Blueprint 2013-2025 said that there was no evidence to suggest that ICT is used to promote skills such as creativity, problem solving, and critical thinking. Furthermore, although e-learning efforts are considered to be a significant corporate investment, many surveys show high drop-out rates or failures (Motaghian, Hassanzadeh, & Moghadam, 2013). Numerous learning institution that offer e-learning face massive difficulty in achieving successful strategies, including the delivery, effectiveness, and acceptance of the courses (Motaghian, et al., 2013). Especially, despite the emerging trend of using various types of e-learning systems to facilitate teaching and learning activities, the number of e-learning users is not increasing as fast as predicted such as the use of web based learning (Motaghian, et al., 2013). In the end, while e-learning has been promoted to various levels of users, the intention to adopt such system is still very low. Although both teachers and students are the primary users of VLE systems, teachers play the most important role in shaping the success or failure of the systems (Motaghian, et al., 2013). If instructors decide to conduct all or part of their teaching activities through a web-based learning system, students have no choice but to use the system (Motaghian, et al., 2013; W.-T. Wang & Wang, 2009). Therefore, it is important to identify the factors that influence teachers adoption of VLE systems to help policymakers on improving the implementation of VLE in Malaysian primary school.

VIRTUAL LEARNING ENVIRONMENT SYSTEMS
Virtual learning system (VLS) is an information system that facilitates e-learning have been widely implemented by education institutions to support face-to-face teaching and self managed learning in the virtual learning and

education environment (W.-S. Lin, 2012). Virtual reality enables a learning environment in cyberspace that is more versatile than the traditional ‘‘chalk-and-blackboard’’ classrooms in that learning takes place as individuals make exchanges of technological interactions either with other individuals or with whatever systems/software used; the application of virtual reality in education is a great leap of teaching methods after the multimedia, computers, and the Internet (Jou & Wang, 2013). By adopting the VLS, students are expected to enhance learning by getting access to course-related information and having full opportunities to interact with instructors and peers in VLE (W.-S. Lin, 2012). In their studies, Jou & Wang (2013) reported that after assessing the technical skills that have been developed for the time period of one semester, the students have reported VLE to be a significantly effective method when considering the three dimensions of ‘‘operation of machines’’, ‘‘selection of process parameter’’, and ‘‘process planning”. The findings therefore proves the benefit of VLE on student learning performance.

TECHNOLOGY ACCEPTANCE MODEL

TAM as a theoretical extension of TRA was first introduced by Davis (1989). TRA is a well-known model in the social psychology domain, which suggests that a person’s behavior is determined by the individual’s intention to perform the behavior and that this intention is, in turn, a function of his/her attitude toward the behavior and his/ her subjective norm (Roca, Chiu, & Martínez, 2006). Attitudes toward the behavior describe the positive or negative feelings toward a specific behavior, and subjective norm assesses the social pressures on the individual to perform or not to perform a behavior (Roca, et al., 2006). TAM adapted from TRA proposes that two particular beliefs, perceived usefulness and perceived ease of use, are the primary drivers for technology acceptance. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his/ her job performance, and perceived ease of use is defined as the degree to which a person believes that using a particular system would be free of physical and mental effort (Davis, 1989). Further, perceived usefulness and perceived ease of use both affect a person’s attitude toward using the system, and consistent with TRA, these attitudes toward using the system determine behavioral intentions, which in turn lead to actual system use. There are numerous studies using TAM and its extended version in explaining user acceptance (Chen & Chao, 2011; Cheung & Vogel, 2013; Chow, Herold, Choo, & Chan, 2012; Hernandez, Jimenez, & Martin, 2009; Jeong, 2011; W. Lee, Xiong, & Hu, 2012; Y.-C. Lee, Li, Yen, & Huang, 2010; F. Lin, Fofanah, & Liang, 2011; Pan & Jordan-Marsh, 2010; Sanchez-Franco, 2010; Teo, Lee, Chai, & Wong, 2009; Yen, Wu, Cheng, & Huang, 2010)

UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

The UTAUT model integrates the fragmented theory and research on individual acceptance of information technology. The theory was formulated, with four core determinants of intention and usage, and up to four moderators of key relationships. UTAUT provides a useful tool for managers needing to. The UTAUT is able to achieve 70% of the variance (adjusted R^2) in usage intention which is rarely found in social science research. Venkatesh et al. (2003) stated that UTAUT is a definitive model that synthesizes what is known and provides a foundation to guide future research in user acceptance area. By encompassing the combined explanatory power of the individual models and key moderating effect, UTAUT advances cumulative theory while retaining a parsimonious structure. Four constructs were recognized as direct determinants of user acceptance and usage behavior: (1) performance expectancy, (2) effort expectancy, (3) social influence, and (4) facilitating conditions

Since its inception in 2003, researchers have increasingly turned to testing UTAUT to explain technology adoption. It was tested and applied to several technologies, such as e-learning (Bakar, Razak, & Abdullah, 2013), social media (Gruzd, Staves, & Wilk, 2012) on-line family dispute resolution services (Casey & Wilson-Evered, 2012), mobile banking (Zhou, Lu, & Wang, 2010), health information technology (Kijsanayotin, Pannarunothai, & Speedie, 2009), online purchasing (San Martín & Herrero, 2012), mobile commerce (Chong, 2013; Min, Ji, & Qu, 2008) information kiosks (Y.-S. Wang & Shih, 2009), e-government (Weerakkody, El-Haddadeh, Al-Sobhi, Shareef, & Dwivedi, 2013), mobile wallet (Shin, 2009).

THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Although the TAM and UTAUT is applicable to various technologies, constructs in the TAM and UTAUT must be extended by incorporating additional factors. These additional factors depend on the target technology, users, and the context (Motaghian, et al., 2013; Shyu & Huang, 2011). The hypotheses are explained as follows.

PERCEIVED USEFULNESS

Previous studies have emphasized the role of the perceived usefulness on intention to use (Kuo & Yen, 2009; Terzis, Moridis, & Economides, 2012). Davis (1989) argued that individuals tend to undertake behaviors they believe will help them perform their job better and more efficiently. When teachers consider VLE system useful, the likelihood to use the system are stronger. Hence, the following hypothesis is developed:

H1. Perceived usefulness will have a significant influence on intention to use VLE system

PERCEIVED EASE OF USE

Perceived Ease of Use (PEOU) is defined as the degree to which a person believes that using the system would be free of effort (Davis, 1989). Previous research has shown that the perceived ease of use is expected to influence directly perceived usefulness and behavioral intention to use (Terzis & Economides, 2011; Tung & Chang, 2008). Hence, the following hypothesis is developed:

H2. Perceived ease of use will have a significant influence on intention to use VLE system

SOCIAL INFLUENCE

Social influence is to the degree to which an individual perceives that important others believe he or she should use a technology (Chiu & Wang, 2008). The concept is similar to subjective norm in theory of planned behavior (TPB) which argued that the more favorable the social influence of a behavior, the stronger would be an individual's intention to perform it. According to innovation diffusion theory (IDT) (Chiu & Wang, 2008), users tend to increase communication with others to interpret their IT adoption. Such increased interactions can influence adoption decision. Studies have showed that subjective norm is a significant predictor of intention to use a system (Chiu & Wang, 2008; Yang, Lu, Gupta, Cao, & Zhang, 2012). Accordingly, the following hypothesis was proposed.

H3. Social Influence will have a significant influence on intention to use VLE system

FACILITATING CONDITION

Factors and resources that an individual believes exist to support his or her activities are termed facilitating conditions (Chiu & Wang, 2008). Previous studies have emphasized the role of facilitating condition on intention to use (Chang & Cheung, 2001; Chiu & Wang, 2008; Teo, 2011). Accordingly, the following hypothesis was proposed.

H4. Facilitating condition will have a significant influence on intention to use VLE system

COMPATIBILITY

Compatibility is the degree to which an innovation is perceived to be consistent with the potential users' existing values, previous experiences, and needs. Greater compatibility generally results in a faster rate of system adoption (Tung & Chang, 2008). Prior literature has investigated compatibility as a significant predictor of intention to use (Liao & Lu, 2008; Tung & Chang, 2008). Thus, the following hypothesis was proposed.

H5. Compatibility will have a significant influence on intention to use VLE system

METHODOLOGY

The data were collected at a major teacher training college located in east coast of Malaysia. At this training college (the number of trainees teacher is about 800 and they will be using VLE system in near future and some of them already used it in a short time). We have provided a brief description of the VLE system before answering the questionnaires so that they get appropriate and sufficient information regarding VLE features and benefit.

In total, 76 trainees teacher completed the survey. We considered only fully completed questionnaires for further analysis. No particular sign was present on the questionnaire, thus guaranteeing perfect anonymity. The survey was designed to gather information about intention to use VLE system. The items used in the questionnaire were validated and come from the existing literatures.

Questionnaire was used as data gathering instrument in this research. The questionnaire is in five-point Likert scale ranging from strongly disagree (1) to strongly agree (5) and consists of 21 items which are related to the six constructs of the research model. The confirmatory factor analysis (CFA) should be done before the structural equation model is examined and the exploratory factor analysis is not necessary for the current study as the instrument of the current research is adapted from previous studies and it has been shown to be a valid instrument in predicting the user's intention to use new information system.

The research model was analyzed using SmartPLS software which is a partial least squares (PLS) structural equation modeling (SEM) tool. We chose PLS for the data analysis since, compared to covariance-based approaches, it is advantageous when the research model is relatively complex and has a large numbers of indicators, the measures are not well established, and/or the relationships between the indicators and latent variables have to be modeled in different modes (i.e. formative and reflective measures) (Fornell & Bookstein, 1982; Motaghian, et al., 2013).

MEASUREMENT MODEL

Analysis of the measurement model within PLS involves examining the item reliability, convergent validity, and discriminant validity (Fornell & Larcker, 1981). The measurement model was assessed in terms of: individual item loadings, reliability of measures, convergent validity and discriminant validity. All items loaded significantly on their latent construct ($p < 0.05$) and exceeded the minimum threshold of 0.4 recommended by Hulland (1999). Reliability was assessed using composite reliability and Cronbach's alpha. All multi-item constructs met the guidelines for composite reliability greater than 0.70 (Hair et al., 2006) and Cronbach's alpha greater than 0.70 (Nunally & Bernstein, 1994). Convergent validity was assessed using average variance extracted. All multi-item constructs met the guideline of average variance extracted greater than 0.50 (Hair et al., 2006). For satisfactory discriminant validity each item should load more highly on its own construct than on other constructs (McGill & Klobas, 2009). In addition, the average variance shared between a construct and its measures should be greater than the variance shared by the construct and any other constructs in the model (Chin, 1998). Table 1 provides a summary of the reliability and convergent validity of the final scales used in the study. Table 2 provides the construct inter-correlations and the square root of average variance extracted for each construct (in bold on the diagonal). In all cases the square root of average variance extracted exceeds the corresponding construct inter-correlations thereby demonstrating discriminant validity (Chin, 1998).

Table 1 Summary of measurement scales

Construct	AVE	Composite Reliability	Cronbachs Alpha
com	0.76	0.93	0.89
eou	0.80	0.92	0.87
fc	0.73	0.89	0.82
it	0.75	0.92	0.89
pu	0.83	0.95	0.93
si	0.85	0.95	0.91

Table 2 Discriminant validity

Construct	com	eou	fc	it	pu	si
com	**0.87**					
eou	0.65	**0.89**				
fc	0.48	0.43	**0.85**			
it	0.76	0.79	0.47	**0.86**		
pu	0.74	0.74	0.51	0.76	**0.91**	
si	0.72	0.63	0.56	0.68	0.72	**0.92**

STRUCTURAL MODEL

Two criteria were used to assess structural model quality: the statistical significance of estimated model coefficients and the ability of the model to explain the variance in the dependent variables. The bootstrapping technique implemented in SmartPLS 2.0 was used to evaluate the significance of these hypothesized relationships. The R^2 of the structural equations for the dependent variables provides an estimate of variance explained (Hair et al., 2006), and therefore an indication of the success of the model in explaining these variables.

RESULTS

A total of 76 teacher trainees (80.3% females and 19.7% males) participated in the study. Teacher trainees ages ranged from a minimum of 18 to a maximum of 25. They had one to three years of experience in using computers. The majority of respondents had certificate or diploma. Figure 1 shows the standardized coefficients for each hypothesized path in the model and the R^2 for each dependent variable. Two of the five hypotheses were supported. Perceived ease of use had a significant positive effect on intention to use of VLE system, thus hypotheses H2 were supported. Contrary to expectations, perceived usefulness did not influence intention to use VLE system, therefore hypothesis H1 was not supported. As hypothesized, the influence of compatibility towards intention to use VLE had a significant positive impact. Therefore hypothesis H5 was supported. Social influence was not found to influence intention to use VLE in this study, thus hypothesis H3 was not supported. Facilitating conditions was not found to influence intention to use of VLE system and as a result, hypothesis H4 was not supported. The capability of the model to explain the variance in the dependent variables was the second criterion used to evaluate the model. The R^2 values are measures of the capability of the model to explain the

variance in the dependent variables and are reported in Figure 1. The model explained 75% of the variability in intention to use VLE.

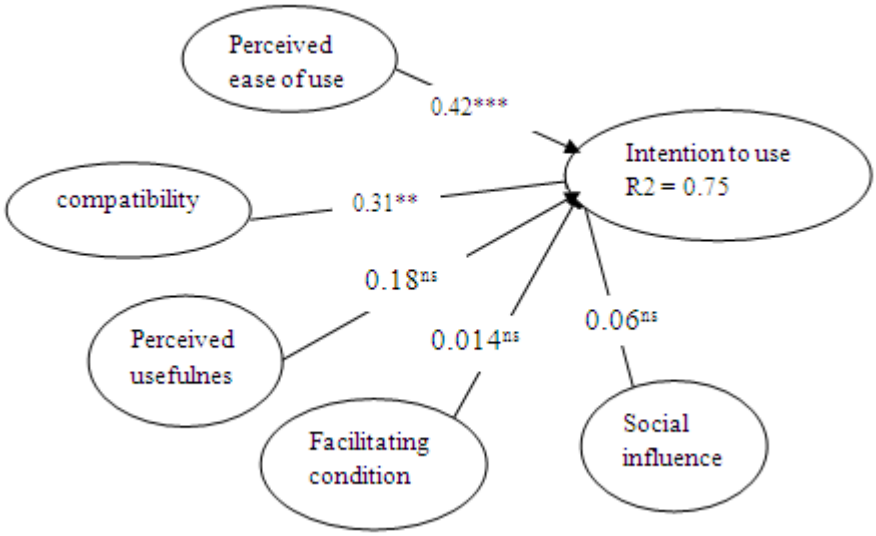


Figure 1: Structural model result

DISCUSSION AND IMPLICATION

This study found that both factors are positively associated with intention to use VLE. Perceived ease of use was identified in this study as a primary determinant of intention to use. The link between perceived ease of use and intention to use has previously been validated in e-learning acceptance research (Roca & Gagné, 2008) and result of current studies was consistence with previous one. We also found that compatibility affects intention and it is also consistence with Tung & Chang (2008).

Our study contributed to an overall conceptual understanding of the nature and the importance of components of TAM, UTAUT and compatibility as determinants in VLE adoption. Our findings also suggested that perceived ease of use was the strongest predictor of an individual's intention to use VLE system. For the policy impact, the ministry of higher education thus should consider providing teachers with the system that will be used regularly and gain benefit on their teaching and learning activities.

LIMITATIONS

The study had several limitations. First, data for this study was collected through survey, therefore, allowing a potential self report bias from respondents. Second, because the data for all the model variables came from single respondents in a one-time survey, common method variance might influence some postulated relations in the path model. Future research should address this issue.

REFERENCES

Bakar, A. A., Razak, F. Z. A., & Abdullah, W. S. W. (2013). Assessing the Effects of UTAUT and Self-Determination Predictor on Students Continuance Intention to Use Student Portal. *World Applied Sciences Journal, 21*(10), 1484-1489.

Casey, T., & Wilson-Evered, E. (2012). Predicting uptake of technology innovations in online family dispute resolution services: An application and extension of the UTAUT. *Computers in Human Behavior, 28*(6), 2034-2045.

Chang, M. K., & Cheung, W. (2001). Determinants of the intention to use Internet/WWW at work: a confirmatory study. *Information & Management, 39*(1), 1-14.

Chen, C.-F., & Chao, W.-H. (2011). Habitual or reasoned? Using the theory of planned behavior, technology acceptance model, and habit to examine switching intentions toward public transit. *Transportation Research Part F: Traffic Psychology and Behaviour, 14*(2), 128-137.

Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & Education, 63*(0), 160-175.

Chin, W. W. (1998). *The partial least squares approach to structural equation modeling.* In G. A. Marcoulides (Ed.), Modern methods for business research (pp. 295–336). Mahwah NJ: Lawrence Erlbaum Associates.

Chiu, C.-M., & Wang, E. T. G. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information & Management, 45*(3), 194-201.
Chong, A. Y.-L. (2013). Predicting m-commerce adoption determinants: A neural network approach. *Expert Systems with Applications, 40*(2), 523-530.
Chow, M., Herold, D. K., Choo, T.-M., & Chan, K. (2012). Extending the technology acceptance model to explore the intention to use Second Life for enhancing healthcare education. *Computers & Education, 59*(4), 1136-1144.
Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.
Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research*, 440-452.
Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.
Gruzd, A., Staves, K., & Wilk, A. (2012). Connected scholars: Examining the role of social media in research practices of faculty using the UTAUT model. *Computers in Human Behavior, 28*(6), 2340-2350.
Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). Multivariate Data Analysis Sixth Edition Pearson Education. *New Jersey*.
Hernandez, B., Jimenez, J., & Martin, M. J. (2009). Future use intentions versus intensity of use: An analysis of corporate technology acceptance. *Industrial Marketing Management, 38*(3), 338-354.
Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: a review of four recent studies. *Strategic management journal, 20*(2), 195-204.
Jeong, H. (2011). An investigation of user perceptions and behavioral intentions towards the e-library. *Library Collections, Acquisitions, and Technical Services, 35*(2–3), 45-60.
Jou, M., & Wang, J. (2013). Investigation of effects of virtual reality environments on learning performance of technical skills. *Computers in Human Behavior, 29*(2), 433-438.
Kijsanayotin, B., Pannarunothai, S., & Speedie, S. M. (2009). Factors influencing health information technology adoption in Thailand's community health centers: Applying the UTAUT model. *international journal of medical informatics, 78*(6), 404-416.
Kuo, Y.-F., & Yen, S.-N. (2009). Towards an understanding of the behavioral intention to use 3G mobile value-added services. *Computers in Human Behavior, 25*(1), 103-110.
Lai, J.-Y., Wang, C.-T., & Chou, C.-Y. (2009). How knowledge map fit and personalization affect success of KMS in high-tech firms. *Technovation, 29*(4), 313-324.
Lee, W., Xiong, L., & Hu, C. (2012). The effect of Facebook users' arousal and valence on intention to go to the festival: Applying an extension of the technology acceptance model. *International Journal of Hospitality Management, 31*(3), 819-827.
Lee, Y.-C., Li, M.-L., Yen, T.-M., & Huang, T.-H. (2010). Analysis of adopting an integrated decision making trial and evaluation laboratory on a technology acceptance model. *Expert Systems with Applications, 37*(2), 1745-1754.
Liao, H.-L., & Lu, H.-P. (2008). The role of experience and innovation characteristics in the adoption and continued use of e-learning websites. *Computers & Education, 51*(4), 1405-1416.
Lin, F., Fofanah, S. S., & Liang, D. (2011). Assessing citizen adoption of e-Government initiatives in Gambia: A validation of the technology acceptance model in information systems success. *Government Information Quarterly, 28*(2), 271-279.
Lin, W.-S. (2012). Perceived fit and satisfaction on web learning performance: IS continuance intention and task-technology fit perspectives. *International Journal of Human-Computer Studies, 70*(7), 498-507.
McGill, T. J., & Klobas, J. E. (2009). A task–technology fit view of learning management system impact. *Computers & Education, 52*(2), 496-508.
Min, Q., Ji, S., & Qu, G. (2008). Mobile Commerce User Acceptance Study in China: A Revised UTAUT Model. *Tsinghua Science & Technology, 13*(3), 257-264.
Ministry of Education Malaysia. (2012). Malaysia Education Blueprint 2013-2025.
Putrajaya: Ministry of Education Malaysia.
Motaghian, H., Hassanzadeh, A., & Moghadam, D. K. (2013). Factors affecting university instructors' adoption of web-based learning systems: Case study of Iran. *Computers & Education, 61*(0), 158-167.
Nunally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory*. New York: McGraww-Hill.
Ong, C.-S., & Lai, J.-Y. (2007). Measuring user satisfaction with knowledge management systems: scale development, purification, and initial test. *Computers in Human Behavior, 23*(3), 1329-1346.
Ong, C.-S., Lai, J.-Y., & Wang, Y.-S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. *Information & Management, 41*(6), 795-804.
Pan, S., & Jordan-Marsh, M. (2010). Internet use intention and adoption among Chinese older adults: From the expanded technology acceptance model perspective. *Computers in Human Behavior, 26*(5), 1111-1119.

Roca, J. C., Chiu, C.-M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. *International Journal of Human-Computer Studies, 64*(8), 683-696.

Roca, J. C., & Gagné, M. (2008). Understanding e-learning continuance intention in the workplace: A self-determination theory perspective. *Computers in Human Behavior, 24*(4), 1585-1604.

San Martín, H., & Herrero, Á. (2012). Influence of the user's psychological factors on the online purchase intention in rural tourism: Integrating innovativeness to the UTAUT framework. *Tourism Management, 33*(2), 341-350.

Sanchez-Franco, M. J. (2010). WebCT – The quasimoderating effect of perceived affective quality on an extending Technology Acceptance Model. *Computers & Education, 54*(1), 37-46.

Shin, D.-H. (2009). Towards an understanding of the consumer acceptance of mobile wallet. *Computers in Human Behavior, 25*(6), 1343-1354.

Shyu, S. H.-P., & Huang, J.-H. (2011). Elucidating usage of e-government learning: A perspective of the extended technology acceptance model. *Government Information Quarterly, 28*(4), 491-502.

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education, 57*(4), 2432-2440.

Teo, T., Lee, C. B., Chai, C. S., & Wong, S. L. (2009). Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the Technology Acceptance Model (TAM). *Computers & Education, 53*(3), 1000-1009.

Terzis, V., & Economides, A. A. (2011). The acceptance and use of computer based assessment. *Computers & Education, 56*(4), 1032-1044.

Terzis, V., Moridis, C. N., & Economides, A. A. (2012). The effect of emotional feedback on behavioral intention to use computer based assessment. *Computers & Education, 59*(2), 710-721.

Tung, F.-C., & Chang, S.-C. (2008). Nursing students' behavioral intention to use online courses: A questionnaire survey. *International Journal of Nursing Studies, 45*(9), 1299-1309.

Venkatesh, V., Morris, M. G., & Davis, G. B. (2003). User Acceptance of Information Technology: Toward A Unified View. *MIS Quarterly, 27*(3), 425-478.

Wang, W.-T., & Wang, C.-C. (2009). An empirical study of instructor adoption of web-based learning systems. *Computers & Education, 53*(3), 761-774.

Wang, Y.-S., & Shih, Y.-W. (2009). Why do people use information kiosks? A validation of the Unified Theory of Acceptance and Use of Technology. *Government Information Quarterly, 26*(1), 158-165.

Weerakkody, V., El-Haddadeh, R., Al-Sobhi, F., Shareef, M. A., & Dwivedi, Y. K. (2013). Examining the influence of intermediaries in facilitating e-government adoption: An empirical investigation. *International Journal of Information Management, 33*(5), 716-725.

Yang, S., Lu, Y., Gupta, S., Cao, Y., & Zhang, R. (2012). Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits. *Computers in Human Behavior, 28*(1), 129-142.

Yen, D. C., Wu, C.-S., Cheng, F.-F., & Huang, Y.-W. (2010). Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM. *Computers in Human Behavior, 26*(5), 906-915.

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior, 26*(4), 760-767.

Future of Online Education in Crisis: A Call to Action

Julie Ann Nash
Prince Mohammad Bin Fahd University, Kingdom of Saudi Arabia
Jnash@pmu.edu.sa

ABSTRACT
Online education is growing rapidly and there is little doubt that it will continue to expand until it one day encompasses the majority of higher education course offerings. Higher education leaders agree that online education will continue to grow even in the face of a slight recent decline (Allen & Seaman, 2013). As the rise of online education began, concern also arose as to whether the quality of higher education would suffer as a result of this new fast tracked course of academia. The quality of education in general is in question. The average degree standards are lower in America (Cote & Allahar, 2011). Today in higher education it is almost unacceptable to expect students to be solely just that, students (2011). Working full time, while carrying a full load is becoming the acceptable norm (2011). This type of student is more often the student that elects an online education. Despite the current drawbacks, online education is still the best prospect for the future provided the barriers of faculty assessment and course design are addressed. Fear of student evaluations and administrative disapproval are causing grade inflation while simultaneously influencing course design. Instructors are designing courses that allow the student to easily pass the course, which in reality is a disservice to everyone involved. This literature review provides evidence to justify a warning to acknowledge the paradox of current faculty assessment practices and the codependent relationship with course structure, to ensure the future value of higher education remain just that; valuable.

Keywords: Online learning, online education, higher education, grade inflation, faculty assessment, student evaluations, cheating, online exams, exam proctoring

INTRODUCTION

The rapid growth of online learning (OL) demands careful attention to the academic vehicle of higher education. Higher education (HE) in general is a slow moving machine. Therefore when anything begins to accelerate out of contextual manner, caution should be taken to carefully attend to the details and direction of the force. OL has been growing at a rate well beyond that of overall HE (Allen & Seaman, 2014). The Babson Survey Research Group has been tracking online education (OE) for more than a decade. There have been eleven reports to date. These reports serve as useful barometers to keep a pulse on the trend of OL in the United States (US). The survey group collects data from more than 2,800 colleges and universities (2014). The latest report however reported a leveling out of the growth curve. Over the past few years online growth has been decreasing (2014).

Despite the seemingly temporary deceleration of OL growth in the US, OL is still considered to be the way of the future. Institutions are including OL in their long term strategies significantly more today than they did in 2002 when the survey's first began (2014). Online classes will continue to grow faster than traditional classes as they have been doing for so long (Thiede, 2012). The number of online students that are taking online courses remains at a steady normative of students taking at least one online course per year (Allen & Seaman, 2014). Interestingly it is found that the greatest increase of OL is occurring in the institutions that are classified by Carnegie as Doctoral Research Universities (Allen & Seaman, 2013).

It is questionable as to whether the push by institutions to increase OE is simply a way to increase their enrollment. Unfortunately the consideration of that possibility brings into question the resulting quality of HE and whether it may suffer in a race to increase enrollment.

Administrators hold a very positive outlook on the future of OE (Allen, Seaman, Lederman & Jaschik, 2012). The increase in administrators that are in favor of increasing OE has jumped significantly in the past decade. The Babcock Survey Group found that the percentage of administrators that considered OE important to the future of the institution went from less than half in 2002 to almost 70% in the 2012 survey (Allen & Seaman, 2013). The survey reflects that administrators believe that an OE is just as good as a face to face education; nearly 77% (2013).

Caution must be taken in the fact that OE means financial gain for institutions, which quite often is in the interests of the administration. Shorter courses are offered online to benefit the institution financially (Shaw,

Chanetzky, Burrus & Walters, 2013). For the institution, OE provides growth opportunity and is cost efficient (Bristow, Shepherd, Humpreys & Ziebell, 2011). The danger is that administration may begin to see OL courses as more prosperous than face to face courses. That perspective can lead to downsizing of tenured faculty and departments.

Even considering the pitfalls of OE becoming a money machine for HE institutions, it still remains one of the best prospects for the future provided certain precautions are taken and prospective pitfalls are admitted and addressed. Online education provides the best prospect for the future value of HE as long as the following barriers are conceded and addressed; methods of faculty assessment and course design. This study will focus on the best ways to proceed into the future of OE by constructing a literature review of current trends in OL in HE, methods of faculty assessment, current course designs of OL in HE and best practices and recommendations for the future of OE.

LITERATURE REVIEW

Current trends in OE.

A current trend in OE is that the perception of students, faculty and administrators do not acquiesce. In fact research shows that students and faculty perceive their roles in almost an opposite way (Community College Research Center (CCRC) pt.2, 2013; Wachenheim, 2009). Students perceive online classes as the "easy way out" (2013). One student was quoted as describing face to face classes as "real learning" (2013). Students report that they feel instructors should be active in their learning experience, while instructors see their role as more of a facilitator or guide (2013).

The CCRC study found, as well as other researchers, that students expect instructors to be "on call" all the time including weekends (CCRC pt. 2, 2013; Mulig & Rhame, 2012). Faculty however, views their availability in quite the opposite way. They believe they should not be on call especially on weekends (2013). Students feel that faculty are responsible to motivate them, while faculty feel that students should be independent learners and self motivated (2013).

The administrators perspective is also quite different from the faculty perspective (CCRC pt.2, 2013). Allen & Seaman (2014) report that according to the findings of the Babcock Research Survey, academic leaders believe that OL is the positive way of the future for HE. Faculty have been reported to be more pessimistic about OE (Allen et al, 2012). Allen et al (2012) reported that almost 2/3's of faculty believe that learning through online courses is inferior to that of face to face classes. Wilkes, Simon & Brooks (2006), also report that faculty believe that face to face classes promote better learning than online classes.

Another current trend in OE is the debate over cheating. Students cheating when taking online courses is vast and increasing (Harmon, Lambrinos & Buffolino, 2010). On the contrary, in one study to investigate student's perspectives, students reported that they cheat less in online courses (Simonson, Hudgins & Orellana, 2009). As reported in the Babson Research Survey, students perceive online courses as easier (CCRC pt. 2, 2013). Kirtman (2009) studied student perceptions of online courses. They compared student's performance in online courses to performance in face to face courses (2009). The same teacher was used for both forms of instruction. Online learners did significantly worse on the midterm than the face to face learners, however the difference disappeared on the final exam (2009). It can be concluded that the students initially expected the course to be easier and once they performed poorly on the midterm they learned that the course was not as easy as they expected and put forth a greater effort for the final exam.

There is a trend to produce massive open online courses (MOOC). These courses allow hundreds of students to enroll and the institution gains considerable funding for these types of courses. Problems arise such as how to grade all the assignments and give the students the personal attention they are used to from online courses. Currently only 5% of HE is offering these MOOC courses (Allen & Seaman, 2014). However over nine percent say that they plan to offer them in the future (2013). The increase in these types of courses may solely be for the financial benefit because though there is an increase in the number of academic leaders that say they plan to offer them, less than ¼ of academic leaders actually believe MOOC is a good method of online instruction (2013). The problem with the small intimate courses is that faculty load will be higher with each faculty member teaching fewer students. Most HE leaders were found to be in expectation of OE reducing the costs to the institution.

METHODS OF FACULTY ASSESSMENT.

One of the common practices of faculty assessment is student evaluations. The problem with student evaluations being used for that purpose is that they do not reflect a teacher's effectiveness (Stark & Freishtat, 2014; Braga, Paccagnella & Pellizzari, 2014). Research shows that student's evaluation are more dependent on student's success, personal motivations and the amount of effort on the student's part (2014). In other words, students will evaluate a teacher higher when they do well in the course themselves or when they get a higher grade. The highly motivated student that makes a concerted effort in the course will typically rate the teacher higher.

Stark & Freishtat (2014) found that students typically fill out the evaluations in detail when they fall into either of the extremes. If the student is pleased with their grade and worked hard through the course, the self satisfaction is reflected in the instructor's evaluation (2014). The same is true for the other extreme. If the student earned a lower grade and lacked effort and self motivation, they are eager to blame the instructor and complain (2014). Anger is a very motivating emotion. Stark & Freishtat (2014) also point out that statistically, conclusions cannot be drawn from such small samples. The typical class size is small for current online courses, especially fast tracked courses. Small sample sizes are not justifiable in measuring anything including performance of a professional. Secondly, it is counterintuitive to expect any kind of meaningful evaluation of a professional by a non-professional (2014).

Students are however, in a good position to report a professor's availability or their own boredom or excitement. For example, a student may complain that a professor was not available enough to help them through the course because the instructor did not answer emails on the weekend. Their perspective is that it wasn't enough, but the institution's perspective is that it is fine. Part time instructor's are not expected to work all through the weekends, just like face to face professors are not expected to work all weekend, or hold weekend office hours.

Better evaluation tools would be the materials the instructor uses in the course such as the instructor's syllabi, the lectures, the assignments, materials created to enhance course exams, samples of student's work that professors have graded and grading rubrics. Furthermore, teacher's ongoing behaviors may be observed easily by the institution. For example, is the teacher revising work? Does the teacher take time to record video? Does the teacher give research supervision online, such as teaching proper APA style and giving feedback on it? And probably most important, is there a normal grading curve?

GRADE INFLATION

More instructors are part time without the security of tenure and may need their positions desperately enough to be more lenient in online courses (Kamenetz, 2014). Kemenetz (2014) found that professors who hand out easy A's get higher student evaluations. Grade inflation is a growing problem in HE (Schutz, Drake & Lessner, 2013). Grade inflation lowers learning standards, lowers the value of education and causes the student to feel entitled thus lowering their efforts (2013). Students gain a false sense of achievement and they then reward the instructor with a favorable student evaluation. Schutz et al, (2013) conducted a study comparing tenured faculty (who feel a greater sense of job security) to adjuncts and found that adjuncts inflated grades significantly more than tenured faculty. More than likely these results reflect the fear that adjuncts have of administrators letting them go.

Barr, Kadiyah & Zussman (2009) conducted what is now known as the famous Cornell study on grade inflation. They studied 500 students and found that grade inflation is steadily increasing, and students were choosing classes with the highest median grade average. These results reflect the desire of students to have an instructor that is willing to give away high grades easily. Since this study Cornell stopped posting the average median grade (2009).

Wellesley College implemented anti-grade inflation policy (Butcher, McEwan & Weerapana, 2014). They found that student evaluations were tied to lenient grading. Once the policy lowered the grade inflation, student evaluations dropped significantly (2014). The problem is that faculty are now trying to satisfy both students and administration, while trying somehow to hang on to some shred of ethical value. Teachers are enticed into planning easy assignments that are easy and fun for the students. The problem is, we as faculty and HE institutions are supposed to be preparing these students for the real world where hard work and effort will be expected. We are also preparing professionals. If students do not really learn and retain the education that our devalued diplomas say they hold, would you really want that so called "accountant" doing your taxes. Or would you like these graduates to be your "lawyer" representing you in court, or worse, have that graduate as your surgeon? It may be tempting to look at simple psychology courses as something that is not really harmed if they student learns the information or not, until they are operating as a professional social worker counseling a teenager contemplating suicide. Suddenly what they are supposed to be an expert in becomes very important to society in general.

Higher average grades in a class are reflective of an instructor that is turning out students that are not really learning the material for any permanent amount of time if at all. Higher average grades in a class lead to less effort of students (Babcock, 2010). Lower average grades on the other hand lead to a greater effort on the student's part (2010). Khanlarian & Singh (2014) describe today's online learner as lazy wanting to do the least amount of work to complete the task. For example most discussion board assignments require a student to make comments to at least two of the peer posts each week. Most students log into the discussion board at one small point during the week and make sure to get their two meaningless posts up and counted for. What learning occurred there? The researchers also found that today's online students do less work and ask for lots of help from the teacher (Babcock, 2010). What would happen in the case of an MOOC class? Would the instructor be responsible for motivating and hand holding each student? It would be impossible. The online student must be self-motivated and self-directed.

Grade inflation harms the student, the individual institution and most of all HE in general. It devalues the student's degree, it devalues the education that comes from that institution and may eventually ruin their reputation and most important it destroys the value of a HE in general.

Therefore it must be concluded that student evaluations must be reconsidered as to what they are used for. Certainly they give insight into the student's perspective, however they are nowhere near an assessment tool for a professional's performance especially the instructor that gave them a grade. If anything at all, it is a conflict of interest. Perhaps administration could put in more effort to really look at all the work the professor has put in to building and improving the course.

CURRENT COURSE DESIGNS OF OL

The social aspect.

Online instruction has developed some structures that appear to be a given such as discussion boards. Originally academic leaders and faculty were worried that online courses take away the social and interactive element that face to face courses provide and those aspects of face to face courses are indeed important (Aksal, 2011). Aksal (2011) constructed an evaluation tool to assess online learning and they found that social interaction is highly important. Social interaction can be implemented into online courses however, what is really lost in online courses compared to face to face courses is the built in discipline of having to put aside a certain time for the course each week. OE looses that forced structure of having to make an effort for the course and with fast courses there is the loss of time to take the material in.

Discussion boards offer very little value to online courses (Sebastianelli & Tamimi, 2011). In a study by Tucker (2012), they examined the social interactive constructs of OE. They found that discussion boards are worthless (2012). The responses were generally brief and didn't reflect scholarly thought (2012). Most of the time the responses did not add anything to the topic (2012). They also found chat sessions to be worthless (2012). Students that type slow ended up going silent in the sessions, or reported feeling left out of the conversation (2012). When they compared discussion boards with face to face class discussions, they found that class discussions promoted student retention and learners perceived the instructor as prompting an atmosphere of community (2012). They also found that instructors in the face to face classes received higher student evaluations (2012).

Group projects are another effort to socialize online coursework. Capdeferro & Romero (2012) found that group assignments cause students frustration. It violates the very reason many of the online students take their courses over the internet. They don't have time to conform to everyone else's schedule. Also the other students in the group don't always do their part. Online learners appear to prefer riddance of group assignments (2012).

Course length.

Course length recently is a paradigm of change in the structure of online courses. Institutions have found ways to generate more income by faster turnover. Accelerated courses are online courses that are completed in less than the traditional 16 week course. Course lengths vary anywhere from 5 to 8 weeks in duration. The research is in the middle on this issue. Shaw, Chametzky, Burrus & Walters (2013) found that 16 week courses were not found to facilitate learning any better than 8 week courses. The only problem with this example is, there were no exams given in the online course, just 18 homework assignments and a final grade generated from the homework assignments.

Ferguson & DeFelice (2010) compared five week courses to 16 week courses. The five week course received higher satisfaction ratings from the students with regard to student to student communication (2010). The students in the 16 week courses expressed higher satisfaction with student to professor communication (2010).

The perceived learning was higher in the 16 week course, however the students in the five week course had significantly higher grades (2010). It was not reported however, whether the students in the five week course had proctored exams or even if they had exams (2010).

Mensch (2013) compared student grades in three week, five week and 14 week courses. They found that students in the three week course had significantly better grades. However when examining the grading distribution, the three week course had a grade compression clustered around A's making the average grade an A (2013). This clearly indicates grade inflation by the course instructor. The research did not report whether exams were proctored or timed, or even if there were exams. The researchers admitted that there was a possibility that the three week course was probably made easier because it was short.

Flexible course lengths may offer the most promise for varying the course length. Zucca (2013) found that adults that were given a flexible time limit to work on the material performed well. They could finish the course faster if they wanted to, as in five weeks, or they could take the full 16 weeks to complete the course. Learning was better in all cases when students were allowed to set their own pace within the bounds of the 16 week traditional course time.

Proctored exams.

In each of the cases of course acceleration, it is expected that students will retain the same information in a very condensed time compared to the traditional 16 week course, whether online or face to face. In each of the studies presented here, the terms of examination or grade assessment were not made clear. Grade assessment is important for to the retention of information and actual learning. Students do cheat when exams are not proctored (Harmon & Lambrinos, 2008). Online students take advantage when exams are not proctored. Two different classes were compared. One class was administered a proctored exam. The other class was not. Three of the previous exams during the semester were unproctored. The class receiving the unproctored exams were not warned they would receive a final proctored exam. They did significantly worse than their previous exams (2008). Furthermore, they did significantly worse on the final exam than the other class who was receiving proctored exams throughout the entire semester (2008). The indication here being that if students do not think they are really going to be tested on their knowledge, without notes or books to help them, they will not make the effort to learn the material. It has to be concluded that no real learning has occurred.

Wachenheim (2009) compared the performance of students in both online and face to face classes on a proctored final exam. They found that the face to face class performed significantly better than the students in the online class (2009). However when comparing students taking a proctored exam to students taking a non-proctored exam the students taking the non-proctored exam performed significantly better, indicating cheating (2009).

Some course designers of online courses believe that letting students retry an answer over and over until they get the correct answer on weekly quizzes will help them better retain the information and promote learning. Wachenheim (2009) found that not to be true. Weekly quizzes were also given to in class students but they weren't allowed to use books or redo the answers until all were correct. The online students were allowed to use books and re-submit answers until the correct answer was found. If the hypothesis is true that retrying until you find the correct answer on weekly quizzes promotes learning, then the online students should have learned more than the students in the face to face class. This however was not what the researchers found. When the proctored final exam was given the in class students performed much better than the online students (2009). The researchers concluded when exams are not proctored online students will cheat and when exams are not proctored online students really do not experience learning (2009).

Further Harmon, Lambrinos & Buffolino (2010) found a correlation between assessment type and cheating. Courses with non-proctored exams affect the credibility of the institution (2010). According to Mayadas, Bourne & Bacsich (2009), it is common practice to take the final exam under a proctor. However that may not be the case today with the recent findings that adjunct professors grade inflate more than professors (Schutz, Drake & Lessner, 2013; Barr, Kadiyah & Zussman, 2009).

Online student profile.

It's possible that students learn from the instructor's leniency that effort is not required. Allen & Seaman (2013) report that today's online students lack discipline. Students in classrooms were found to put more time into a course than students online put into a course (Brown & Liedholm, 2002). It is possible that the academically stronger student gravitates to the face to face method of instruction. Research does show that academically stronger students tend to gravitate towards face to face classes (Driscoll, Jicha, Hunt, Tichavsky & Thompson, 2012). They found that online classes were perceived as easier, therefore they attracted the weaker students

(2012). Overall GPA's of online students are found to be lower (2012). Withdrawal is also higher with online students (2014).

RECOMMENDATIONS FOR QUALITY ONLINE EDUCATION

Improvement begins with the institution and the administration. The institution should create readiness activities for students to determine the probability that they will be successful in online courses (CCRC pt.2, 2013). Institutions should make sure that faculty receive professional development (CCRC pt.2, 2013). Entrance requirements may be a course of action to ensure quality of OL and administer a connotation of greater effort and value of the OE, such as minimum grade point average standards to be eligible to enroll in online courses (CCRC pt.2, 2013).

Institutional responsibilities.

Institutions must have a teaching plan and a reliable technical delivery system (Institute of HE policy, 2000). Khanlarian & Singh (2014) found that students are frustrated when there are IT issues. Student frustration is important because frustration is correlated to student's success (2014). There should be a centralized tech system in place that both students and faculty may rely on (2014).

The institution should show an interest in the faculty by actually reviewing instructional materials periodically while minimizing their reliance on student's evaluations. The Institute of HE policy (2000) suggests that minimal standards should be used for development, design and delivery. Technical assistance should be available to the instructors and instructors should receive training and assistance in technology for the courses (2000).

Instructor evaluation should be based on the syllabi, the lectures, the assignments, the materials used to enhance the course, the assessment methods used in the course and samples of the student's work, that have been graded by the professor. Instructor or faculty evaluations should not be rooted on student evaluations (Stark & Freishtat, 2014). In a research university it is even more important to evaluate an instructor's grading rubric to ensure that they are properly preparing students for academic level research and writing skills.

At the conclusion, institutions will eventually be held accountable for students actually learning and retaining information for the college credits they bestowed upon their graduates (Brazina & Ugras, 2014).

Faculty responsibilities.

Faculty should ensure daily communication. They should provide feedback in a reasonable efficient time (Barr & Miller, 2013). They should express high expectations and embrace cultural diversities (2013). Their instructions should be very specific with the use of rubrics given in advance, preferable in the course guide (Thiede, 2012). Therefore students will have a good concept of what the instructor is looking for when grading an assignment. The assignments should cause students to engage in research, discuss the course material with others and force them to take an analytical approach (Thiede, 2012).

Exams should always be proctored or timed allowing no more than 2 minutes maximum per question (Institute of HE policy, 2000; Wachenheim, 2009; Barnes & Paris, 2013; Mayadas, Bourne & Bacsich, 2009; Stanley, 2006; Harmon & Lambrinos, 2008; Kirtman, 2009). The use of proctored test sites is best. However, sometimes that is not possible therefore timed exams are essential. Timed exams that allow 24 or 48 hours for the students to look up the answers are not considered "real" exams. That type of "exam" is really nothing more than a homework assignment.

Exams should be single entry online. Students should not be permitted to save the exam and come back later to finish it. Exams should be changed each semester (Barnes & Paris, 2013). If possible lock the student's browser during testing (2013). The questions should be changed each semester (2013). Questions on exams should concentrate more on conception rather than general knowledge (Wachenheim, 2009).

Student responsibilities.

Students should make the strongest effort in an online class. Students should be self-motivated and operate as self-directed learners. Students must take OE seriously and apply themselves accordingly. Students must realize that they will not benefit from the least amount of work possible (Khanlarian & Singh, 2014). Research shows that better note taking in class results in better grades (Nakayama, Mutsuura & Yamamoto, 2014). Unfortunately it is found more and more that students prefer courses that require the least amount of effort and time (Marshall, Greenburg & Machun, 2012). Student effort was found to be one of the best indicators of success in OE (Firmin,

Schiorring, Whitmer, Willett, Collins & Sujitparapitaya, 2014). The entire online environment is weakened when a professor's time is consumed by students who do not put forth a copious effort to succeed.

CONCLUSIONS

OE is the fastest growing segment of HE and it is a positive academic direction. However, there are cautionary situations that must be addressed immediately. There are two paths presenting themselves in front of OE as it approaches its future. One path will degrade HE in general and devalue education in the US considerably. The US is currently the country with the most successful online programs in the world (Mayadas, Bourne & Bacsich, 2009). With the US leading the future of OE, it is important for change to begin in the US.

The other path is to sustain a strong and vital growth in HE that not only maintains integrity but strengthens HE. The possibility presents itself to elevate HE to a level of value higher than it has ever been. But to do that, there are barriers that demand extraction. The use of student evaluations for any sort of faculty performance indicator must be eliminated. Student evaluations may still be collected but the use and value should be placed elsewhere.

True exams must be required of all faculty. Proctored or limited timed exams must be used. Some studies report success with the use of web cameras, however complaints of costs have impeded that form of assessment becoming common (Barnes & Paris, 2013). Administrators must give clear guidelines of exam expectations and monitor grading curves. Faculty should have a normal grading curve in the course. Faculty that have an average grade of "A", should be evaluated closely.

The design of online courses should include a social aspect but not as the most important standard for success. Success should be surmised on the premise that learning has occurred. It is not just assumed learning that is considered acceptable, but learning with some form of verification. OE must include clear communication between the student, faculty and institution which starts with a clear and detailed course guide that is approved by the institution, endorsed by the faculty and understood by the student. Grading rubrics and high expectations married to strong student effort and motivation will result in a strong education in the US and the world. As educators, we are in agreement that the most important objective of what we do is to induce or facilitate learning in the student. Cote and Allahar (2011) stated it very well when they said "Simply handing someone a credential, without the personal and intellectual resources to back it, is to shortchange that person" (p. 119).

REFERENCES

Allen, E. & Seaman, J. (2014). Grade change: Tracking online education in the United States. *The Sloan Consortium.* Retrieved from http://www.onlinelearningsurvey.com/reports/gradechange.pdf

Allen, E., Seaman, J. Lederman, D. & Jaschik, S. (2012). Conflicted: Faculty and online Education, 2012. *The Sloan Consortium.* Retrieved from http://www.insidehighered.Com/sites/default/server_files/survey/conflicted.html

Allen, E. & Seaman, J. (2013). Changing course: Ten years of tracking online education In the United States. *The Sloan Consortium.* Retrieved from http://www.onlinelearningSurvey.com/reports/changingcourse.pdf

Allen, E. & Seaman, J. (2009). Learning on demand: Online education in the United States, 2009. *The Sloan Consortium.* Retrieved from http://www.sloansurvey/pdf/learningondemand.pdf

Aksal, F. A. (2011). Developing evaluative tool for online learning and teaching process. *The Turkish Online Journal of Educational Technology, 10*(3). Retrieved from http: //eric.ed.gov/?id=EJ944933

Babcock, P. (2010). Real costs of nominal grade inflation? New evidence from student course Evaluations. *Economic Inquiry, 48*(4), 983-996. doi:10.1111/j.1465-7295.2009.00245.x

Bar, T., Kadiyali, V. & Zussman, A. (2009). Grade information and grade inflation: The Cornell experiment. *Journal of Economic Perspectives, 23*(3), 93-108. doi:10.1257/jep.23.2.93

Barnes, C. & Paris, B. L. (2013). An analysis of academic integrity techniques used in online courses at a southern university. *Northwest Decision Sciences Institute Annual MeetingProceedings.* Retrieved from http://nedsi.org

Barr, B. A. & Miller, S. F. (2013). Higher education: The online teaching and learning Experience. *Online Teaching and Learning.* Retrieved from http://files.eric.ed.gov/Fulltext/ED543912.pdf

Braga, M., Paccagnella, M. & Pellizzari, M. (2014). Evaluating students' evaluations of professors. *Economics of Education Review, 41*, 71-88. doi:10.1016/j.econedurev.2014.04.002.

Brazina, P. R. & Ugras, J. Y. (2014). Growth and changes in online education. *Pennsylvania CPA Journal, 85*(3).

Bristow, D., Shepherd, D. C., Humphreys, M. & Ziebell, M. (2011). To be or not to be: That isn't the question! An empirical look at online versus traditional brick-and-mortar courses at the university level. *Marketing Education Review, 21*(3), 241-250. doi:10

.2753/MER1052-8008210304
Brown, B. W. & Liedholm, C. E. (2002). Can web courses replace the classroom in principles of microeconomics? *American Economic Review, 92*(2), 444-448. doi: 10.1257/0002828020191778
Butcher, K. F., McEwan, P. J. & Weerapana, A. (2014). The effects of an anti-grade-inflation policy at Wellesley College. *Journal of Economic Perspectives, 28*(3), 189-204. doi:10.1257/jep.28.3.189
Capdeferro, N. & Romero, M. (2012). Are online learners frustrated with collaborative learning experiences? *The International Review of Research in Open and Distance Learning, 13*(2). Retrieved from http://www.irrodl.org/index.php/irrod1/article/view/1127/2179
Cote, J. E. & Allahar, A. L. (2011). *Lowering Higher Education: The Rise of Corporate Universities.* Toronto, University of Toronto Press Incorporated.
Community College Research Center pt. 2 (2013). Creating an effective online environment. *Teachers College, Columbia University.* Retrieved from http://ccrc.tc.columbiaEdu/media/k2/attachments/creating-effective-online-environment.pdf
Driscoll, A., Jicha, K., Hunt, A. N., Tichavsky, L. & Thompson, G. (2012). Can online courses deliver in-class results? A comparison of student performance and satisfaction in an online versus a face-to-face introductory sociology course. *Teaching Sociology, 40*(4), 312-331. doi:10.1177/0092055X12446624
Ferguson, J. & DeFelice, A. (2010). Length of online course and student satisfaction, perceived learning, and academic performance. *International Review of Research in Open and Distance Learning, 11*(2), 73-84. Retrieved from http://0-search.ebscohost.com.library.acaweb.org/login.aspx?direct=true&db=eric&AN=EJ895748&site=eds-live
Firmin, R., Schiorring, E., Whitmer, J., Willett, T., Collins, E. D. & Sujitparapitaya, S. (2014). Case study: using MOOCs for conventional college coursework. *Distance Education, 35*(2), 178-201. doi:10.1080/.01587919.2014.917707
Harmon, O. R., Lambrinos, J. L. & Buffolino, J. (2010). Assessment design & cheating risk in Online instruction. *Online Journal of Distance Learning Administration, 13*(3). Retrieved from http://www.westga.edu/~distance/ojdla/fall133/harmon_lambrinos_buffolino133.html
Harmon, O. R. & Lambrinos, J. (2008). Are online exams an invitation to cheat? *Journal of Economic Education,39*(2), 116-125. doi:10.3200/JECE.39.2116-125
Herman, J. H. (2013). Faculty development programs: The frequency and variety of professional development programs of professional development programs available to online instructors. *Journal of Asynchronous Learning Networks, 16*(5), 87-106.
Khanlarian, C. J. & Singh, R. (2013). An exploratory study of the online learning environment. *Issues in Accounting Education, 29*(1), 117-147. doi: 10.2308/iace-50614
Kirtman, L. (2009). Online versus in-class courses: An examination of differences in learning outcomes. *Issues in Teacher Education, 18*(2), 103-116. Retrieved from http://eric.ed.Gov/?id=EJ858508
Marshall, J., Greenberg, H. & Machun, P. A. (2012). How would they choose? Online student preferences for advance course information. *Open Learning, 27*(3), 249-263. doi:10.1080/02680513.2012.716656
Mayadas, A. F., Bourne, J. & Bacsisch, P. (2009). Online education today. *Science, 323*(5910), 85-89. doi:10.1126/science.1168874
Mensch, S. (2013). The relationship between course grades and retention rates when the same Class is offered in different time lengths. *Insights to a Changing World Journal, 2013*(3).
Mulig, L. & Rhame, S. (2012). Time requirements in an online teaching environment: How to be more effective and efficient in teaching online. *Journal of Accounting and Finance12*(4), 101-109.
Nakayama, M., Mutsuura, K. & Yamamoto, H. (2014). Impact of learner's characteristics and learning behavior on learning performance during a fully online course. *TheElectronic Journal of e-Learning, 12*(4), 394-408. Retrieved from http://www.ejel.org
Schutz, K. R., Drake, B. M. & Lessner, J. (2013). Do community college full-time and Adjunct faculties differ in their perceptions of rigor in assigning grades? *American Journal of Educational Studies, 6*(2), Retrieved from http://www.amhighed.com/ajes.htm
Sebastianelli, R. & Tamimi, N. (2011). Business statistics and management science online: Teaching strategies and assessment of student learning. *Journal of Education for Business, 86*, 317-325. doi:10.1080/08832323.2010.525545
Shaw, M., Chametzky, B., Burrus, S.W. & Walters, K. J. (2013). An evaluation of student outcomes by course duration in online higher education. *Online Journal of Distance Learning Administration, 16*(4). Retrieved from http://www.westga.edu/~distance/ojdla/Winter164/shaw_chametzky_burrus_walters164.html
Simonson, M. R., Hudgins, T. L. & Orellana, A. (2009). *The Perfect Online Course: Best Practices for Designing and Teaching.* Charlotte, N.C., Information Age Publication.
Stanley, O. L. (2006). A comparison of learning outcomes by 'incourse' evaluation techniques for an on-line course in a controlled environment. *The Journal of Educators Onine, 3*(2), 1-16.

Stark, P. B. & Freishtat, R. (2014). An evaluation of course evaluations. *Center for Teaching and Learning, University of California, Berkley.* Retrieved from http://www.stat.berkeley.edu/~stark/Preprints/evaluations14.pdf

Stevens, R. (2004). Proposals presented to curb grade inflation. *Princeton Weekly Bulletin, 93*(24). Retrieved from http://www.princeton.edu/pr/pwb/04/0419/1b.shtml

The Institute for Higher Education Policy (2000). Quality on the line: Benchmarks for success in internet-based distance education. *National Education Association,* 1-45. Retrieved from http://www.nea.org/assets/docs/HE/QualityOnTheLine.pdf

Thiede, R. (2012). Best practices with online courses. *US-China Education Review A*(2), 135-141.

Tucker, S. Y. (2012). Promoting socialization in distance education. *Turkish Online Journal of Distance Education, 13*(1). Retrieved from http://tojde.anadolu.edu.tr/tojde46/articles/article_11.htm

Wachenheim, C. J. (2009). Final exam scores in introductory economics courses: Effect of course Delivery method and proctoring. *Review of Agriculture Economics, 31*(3), 640-652. Doi:10.111/j.1467-9353.2009.01458.x

Wilkes, R.B., Simon, J. C. & Brooks, L. D. (2006). A comparison of faculty and undergraduate, student perceptions of online courses and degree programs. *Journal of Information Systems Education, 17*(2), 131-140

Zucca, G. (2013). Classroom course model: A different model needed for adult online students? *The International Journal of Technology, Knowledge and Society, 9*, 99-107.

Identify the Motivational Factors to Affect the Higher Education Students to Learn Using Technology

Dr. Hon Keung YAU
City University of Hong Kong, Department of Systems Engineering and Engineering Management, Kowloon Tong, Kowloon, Hong Kong
honkyau@cityu.edu.hk

Dr. Alison Lai Fong CHENG
Independent researcher
alisoncheng_lai_fong@yahoo.com.hk

Miss Wing Man HO
City University of Hong Kong, Department of Systems Engineering and Engineering Management, Kowloon Tong, Kowloon, Hong Kong.
wing4477hk@yahoo.com.hk

ABSTRACT
The purpose of this study is twofold. Firstly, engineering students' motivation in using technology for learning in one of Hong Kong universities is investigated. Secondly, new research model about students' perception in using technology for learning is developed. Survey was employed and the questionnaires were distributed to targeted university under study. 211 questionnaires were collected. The major findings of this study are that (i) Confidence was positively related to Relevance; (ii) Satisfaction was positively related to Confidence; (iii) Relevance was positively correlated with Satisfaction; (iv) Interest is positively related to Relevance; (v) Perceived personal ability is positively associated with Confidence; (vi) Confidence is positively associated with perseverance; (vii) Confidence, is negatively associated with anxiety; and (viii) Satisfaction is positively associated with social influence.

Keywords: Anxiety; Confidence; Relevance; Satisfaction; Interest; Perceived personal ability; Perseverance; Social influence.

1. INTRODCTION
Motivation plays an essential role in learning and it affects various fields of education (Kahveci, 2010). Also, there are extensive educational literature which is related to the student's motivation for learning and the instructional strategies affecting the student's motivation (Keller, 1984; 1987; 2010; Oliver & Reeves, 1996; etc.). However, it appears that there is little research on undergraduates' perception on the use of educational technology. Also, the research about the relationship among the motivational factors of the ARCS model for the use of technology (Keller, 2010) is lacking. Wenhao et al (2006) pointed out that there were lack of instruments that could validly measure motivational level. In addition, previous studies related to the ARCS model and the motivational instrument such as the Instructional Material Motivational Survey (IMMS) only focused on the information searching and instructional gaming (Dempsey & Johnson, 1998; Klein & Freitag, 1991). Therefore, the purpose of this study is to fill this research gap to determine undergraduates' perception in the use of technology and the relationship among the motivational components. This study is undertaken at one of the Hong Kong universities. Students need to use technology for learning such as searching information on internet, using software (SPSS, AutoCad, Compiere, PowerPoint, Excel). On the other hand, instructors use technology to teach students such as internet, video, educational software and other telecommunication devices. However, it is not easy for educators to motivate students to learn in the university. Some of the students may be absent from the course because they may feel boring about the courses. Then, it would affect the effective learning for the students. Hence, the purpose of this study is to examine the engineering students' perception of motivation in using technology for learning. This study also gives a fundamental understanding of engineering students' perception of motivation in using technology for learning to the educators in order to integrate technological component to enhance students' learning and motivation to learn during the design process of the course.

The research question to be addressed is "What is the relationship between the motivational factors about the use of technology for learning?"

2. LITERATURE REVIEW
2.1 Development of Educational technologies in Hong Kong universities
Educational technologies were employed in most of Hong Kong universities. Students use those technologies to learn in university. Technology can be divided in software and hardware. Considering the software, the Internet and the World Wide Web are widely used as a tool of teaching and learning in education. The Internet provides a

platform for students to access unlimited information (Langin, Ackerman & Lewark, 2004). Undergraduates commonly use the Internet for communication with classmates or teachers via email, newsgroup or discussion forums, searching information from the Internet, checking news, doing research etc (Blanche & Kathleen, 2010). Moreover, Blackboard is a popular course management system in most universities in Hong Kong. It plays an important role is to build community among student and teachers. Since after the three hours lecture per week, there is not enough time to build a learning environment to students. Thus, a blackboard can help teachers sustain the learning environment to students in order to help the students achieve their learning goals (Lang, 2008). Furthermore, there are many functions of the blackboard and here we will introduce some of the popular functions, such as discussion board, email and library database. For the hardware, there are many learning tools such as personal computer, laptop and cell phone.

The positive effects of the instructional technology are strongly depends on students' motivation to use technology (Kahveci, 2010). Previous research found that different technology can have different effect on students' motivation. Web-based Learning becomes popular in university and students can access the course materials online. Though the online course materials like exercises and assignments, students can understand the concepts of the course. Since practice is important in programming course, a web-based learning environment with automated feedback and assessment is developed in one of Hong Kong University (Ronnie, 2005). It can help students learn the Java Servlet programming by the automatic feedback of their assignments. Then, students can learn from their mistakes and motivate them to practice more and more. For an online course, much research revealed that it has many advantages, which can motivate students to learn. The social capital was found in online courses (Andrew, Yannie, Reggie, 2005). Social capital has a positive relationship with effective learning in colleges. It can facilitate the social interaction processes through the online learning platforms. Hence, students can learn how to deal with the complexity social interaction, human characteristics and the conditions of community development through the online learning platform. Another advantage is the flexibility in online learning and they have positive influence on learning since they study when they can study (Kyong-Jee, Shijuan, Curtis, 2005). Moreover, it can help them develop the virtual teaming skills, which is important skill for the workplace in the global business environment. In additional, online learning allow learners to have more time to think critically and reflectively and stimulus higher order thinking such as analysis, judgment and application of knowledge (Daniel, Amber, Kevin, 2010). Email is one of the educational technologies which can improve interactions between instructors and students such as sending some supportive information with personal attention to each student who improves interactions between instructors and students such as sending some supportive information with personal attention to each student. Moreover, PowerPoint is the main presentation software used in the university, which used to deliver information to students. Previous study indicated that the use of PowerPoint can maintain the university students' interest in lectures (Jennifer, 2008).

2.2 ARCS Model

The ARCS Model was used as a base for our study. ARCS Model is a method for improving the instructional materials interesting and motivated (Keller, 1984). Keller (1984) defines that there are four categories in motivation based on the extension of the motivational literature review. The four categories are attention, relevance, confidence and satisfaction. Attention is about gaining and sustaining attention to the instructional content. Relevance is about relating to learning objectives and future use of learning. Confidence is about building confidence in learning and accomplishment. Satisfaction is about promoting the potential for learning satisfaction.

Afterwards, Kahveci (2010) used and expanded the ARCS model in his study. He indicated that there are eight factors affecting students' perception in using technology for learning. Kahveci (2010) named the factor components as Relevance, Interest, Confidence, Satisfaction, Personal Ability, Social Influence and Perseverance. In addition, one technology component "anxiety" was added in our study. Technology anxiety is also one of the students' perceptions in using technology for learning (Agatha & Don, 2008).

2.3.1 Relevance

Relevance is one of the important factors which affects students' motivation to use technology for learning. According to the ARCS model, relevance refers to people's feelings or perceptions of attraction toward desired outcomes, ideas, or other people based upon their own goals, motives and values (Keller, 2010). Based on the psychological basis, relevance not only occurs when the content to be learned is useful to one's work, but also occurs when there is a match between teaching and learning styles, a match between the content and one's personal interests, when one can relate prior knowledge and experience to the content, and when the content and performance requirements are consistent with one's personal and cultural values (Keller, 2010). Students are more motivated to learn the new knowledge which can help them achieve a goal in the future, such as getting a job, getting a raise, getting a promotion or improved job performance (Keller, 2010). Thus, students are

motivated to use technology for learning when it is related to their goals or their future jobs.

2.3.2 Interest

According to ARCS Model, interest belongs to the relevance category and it is an important component for this category. Schank (1979) defines interest as the attraction or concern we feel toward events or objects because they touch upon our most basic needs and fears, or absolute interest. People tend to be interested in the content that is related to their personal interests (Keller, 2010). Thus, the student's interest in using technology for learning is related to the relevance in student's goal.

2.3.3 Confidence

As I have mentioned above, confidence is one of the components of ARCS models. Keller (2010) defines confidence as people's expectancies for success in the various parts of their lives. In other words, it means the degree of people who can predict and control their behavior. Locus of control, self-efficacy and attribution theory are the obvious theory regarding the confidence and personal control.

2.3.4 Perseverance

Perseverance is one of the effects of confidence. As the attribution theory mentioned above, if the person have confidence, the perseverance will be relatively high to achieve the goal (Weiner, 1992). Moreover, self-efficacy is positively related to perseverance (Bandura, 1977). High self-efficacy leads to higher and more perseverance when faced with obstacles and it also leads to higher attainment. In the learning environment, research found that students in high self-efficacy spent more effort in learning from difficult materials, such as learning from text than TV (Salomon, 1984). Some research found that students with high self-efficacy appeared to have more flexible learning styles and coping strategies with greater persistence (Nichols & Miller, 1994).

2.3.5 Anxiety

Anxiety refers to an unpleasant emotional state with qualities of apprehension, dread, distress and uneasiness (Reber, 1985). Computer anxiety is the common one. It means that users interact with computers and experience mixed feelings, like fear, stress and resistance to learn how to use them and cannot control the computer in their life and these feelings may limit people's abilities to learn using computers (Korobili, Togia , Malliari, 2010). Previous study found that there are strong negative correlation between confidence and anxiety (Bandura, 1997; Agatha and Don, 2008; Weiner, 1992; 1974).

2.3.6 Perceived personal ability

Perceived personal ability refers to people's beliefs that their abilities will influence their expectancies for success, attributions, and performance (Keller, 2010), which is one kind of the confidence category in the ARCS model. There were two concepts of perceived personal ability, which is entity concept of ability and incremental concept of ability. Entity concept of ability means that people believe that they either have an aptitude for a given activity or they do not, or, that they have a specific level of ability and that they cannot change it to any meaningful degree (Keller, 2010). In contrast, incremental concept of ability refers to the belief that one's ability in any of these areas can be improved with effort (Keller, 2010). This factor was closely related to self-efficacy, which is the person's belief that he or she can succeed in using technology for learning (Bandura, 1977). Positive relationship between self-efficacy and perceived personal ability was found in extensive educational research (Ashton & Webb, 1986; Woolfolk & Hoy, 1990).

2.3.7 Satisfaction

Creating satisfaction can continually motivate students on using technology for learning. Intrinsic motivation and extrinsic reinforcements are the two important elements in the satisfaction category. Intrinsic motivation is also named as intrinsic satisfaction, which means when students who perform the challenging and meaningful task successfully, then their feeling of satisfaction will be relatively high. For example, when students achieved a desirable level of success while studying the meaningful or relevant topics, then higher intrinsic satisfaction will be resulted. Moreover, it has been reported that intrinsic motivation is always a key to develop an effective instructional system in order to have motivate students in learning (Oliver & Reeves, 1996). On the other hand, if students' motivation are based on the extrinsic reinforcement, such as getting a good grade and they do not get it, then lower satisfaction will be resulted even they have positive intrinsic satisfaction (Keller , 2010). Thus, the satisfaction category is related to the relevance category since students will feel the level of satisfaction when they can achieve their goals at the certain task.

2.3.8 Social Influence

Social influence is another factor which will affect students' motivation in using technology for learning. Satisfaction is the only one factor which affects the social influence. With respect to the satisfaction, people's

feelings of satisfaction are influenced by their subjective evaluation if an outcome based on their expectations and social comparisons. In other words, when the outcomes are not what people expected they will probably modify their feelings or attitudes and this will influence their future motivation for that task. And, they will compare what happens to them to what happens to others and to their own expectations (Keller, 2010). For example, students get the same grade in group project and students feel unfair when they have done a lot of work compared to the others group members, then their satisfaction will be depressed.

2.3.9 Development of Hypotheses

According to the ARCS model as mentioned above, there are positive relationship among the category of Relevance, Confidence and Satisfaction (Keller, 1984; 2010; Oliver & Reeves, 1996; Wenhao et al, 2006). Thus, the following hypotheses were developed:

H1: Confidence is positively related to Relevance.
H2: Satisfaction is positively related to Confidence.
H3: Relevance is positively related to Satisfaction.

According to the ARCS model, the psychological theory of interest is related to the category of Relevance (Keller, 2010; David, Jon, Matthew, 1995; Hidi & Baird, 1986). Hence, the following hypothesis was developed:
H4: Interest is positively related to Relevance.

Based on the ARCS model, there were positive relationship between Confidence and Perceived Personal Ability, and Perseverance and negative relationship between Confidence and Anxiety (Keller, 2010; Agatha and Don, 2008; Ashton & Webb, 1986; Bandura, 1997; Korobili, Togia , Malliari, 2010; Nichols & Miller, 1994; Paula, Nicole , Samantha , Brendan. 2008; Woolfolk & Hoy, 1990 and Weiner 1992; 1974). Thus, the following three hypotheses were developed:

H5: Perceived personal ability is positively associated with Confidence.
H6: Confidence is positively associated with perseverance.
H7: Confidence, is negatively associated with anxiety.

Finally, there is positive relationship between Social Influence and Satisfaction according to the ARCS model (Keller, 2010; Lee, et al, 2003; So & Brush, 2008). Thus, the following hypothesis was developed:
H8: Satisfaction is positively associated with social influence.

Figure 1 shows the new research model about students' perception in using technology for learning.

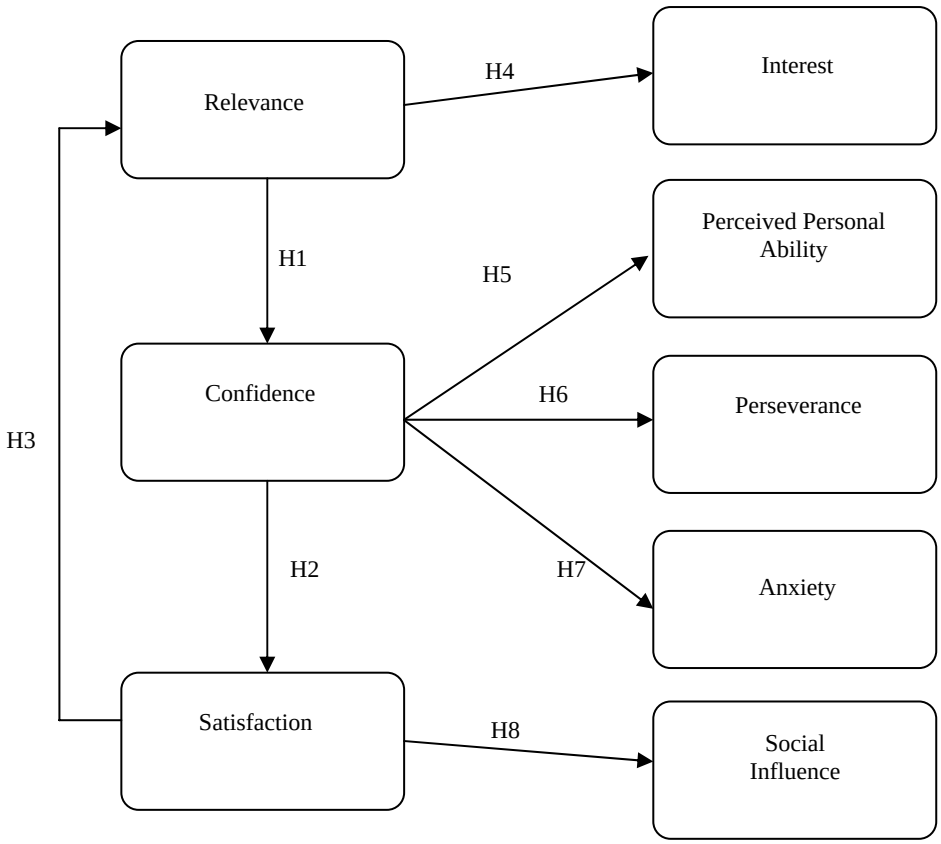


Figure 1: The Research Model of Student's Perception in Using Technology for Learning

3. RESEARCH METHOD

3.1 Constructs Measure and Questionnaire Design

A questionnaire was used in this study to investigate students' motivation in using technology for learning. There are 44 items as shown in Table 1 for eight dependent constructs in the questionnaire: namely, confidence (Q1 to Q5), perceived personal ability (Q6 to Q10), satisfaction (Q11 to Q15), social influence (Q16 to Q20), relevance (Q21 to Q26), perseverance (Q27 to Q30), interest (Q31 to Q35), anxiety (Q36-Q44). The constructs "confidence", "perceived personal ability", satisfaction", social influence", relevance", perseverance" and "interest" were derived from the modified Fennema-Sherman Attitudes Scales (Kahveci, 2010) while the construct "anxiety" was derived from the Technology anxiety of Computer Technology Use Scale (CTUS) (Agatha and Don, 2008). The constructs "confidence", "perceived personal ability", satisfaction", social influence", relevance", perseverance" and "interest" were rated from a 5-point Likert type scale, ranging from 1 "strongly agree" to 5 "strongly disagree". The construct "anxiety" was rated from a 7 - point Likert type scale, ranging from 1 "comfortable" to 5 "uncomfortable".

Table 1 – Items of questionnaire

ITEMS	Factor Loading
Confidence (1-5 scale from strongly agree to strongly disagree)	
1. I am sure I can do advanced work in technology.	.712
2. I am sure I can use technology.	.516
3. I think I could handle more difficult technology problems.	.711
4. I can get good grades in the courses related to technology.	.726
5. I have a lot of confidence when it comes to the use of technology.	.774
Eigenvalues Percentage of variance explained Cronbach's Alpha	3.439 68.788 0.886
Perceived personal ability (1-5 scale from strongly agree to strongly disagree)	
6. I am not good at using technology.	.734
7. I don't think I could use advanced technology.	.801
8. For some reasons even though I work too hard on it, using technology seems unusually hard for me.	.764
9. Most subjects I can handle okay, but I have a knack for flubbing up the problems about the use of technology.	.744
10. Technology related courses have been my worst courses.	.750
Eigenvalues Percentage of variance explained Cronbach's Alpha	3.793 75.863 0.920
Satisfaction (1-5 scale from strongly agree to strongly disagree)	
11. It would make me happy to be recognized as an excellent student in the use of technology.	.625
12. I'd be happy to get top grades in the courses in which we use technology.	.707
13. Being first in the competition related with the use of technology would make me pleased.	.707
14. Being regarded as a smart in the courses in which we use technology would be great thing.	.612
15. I like using technology.	.338
Eigenvalues Percentage of variance explained Cronbach's Alpha	2.881 57.619 0.803
Social influence (1-5 scale from strongly agree to strongly disagree)	
16. Winning a prize in technology related courses would make me feel unpleasantly conspicuous.	.440
17. People would think I was some kind of nerd if I get good grades in technology related courses.	.536
18. If I got the highest grades in technology related courses I would prefer no one knew.	.672
19. It would make people like me less if I were really good student in the	.742

technology related courses.	
20. I don't like people to think I am smart in the technology related courses.	.619
Eigenvalues Percentage of variance explained Cronbach's Alpha	3.008 60.170 0.833
Relevance (1-5 scale from strongly agree to strongly disagree)	
21. I try to use technology since I know how useful it is.	.653
22. Learning the use of technology is worthwhile and necessary subjects.	.699
23. I will need a firm mastery using technology in my future work.	.676
24. It does not make any difference whether I use technology.	.460
25. The use of technology will not be important in the rest of my life.	.735
26. I think technology is the area that I use rarely in my life.	.619
Eigenvalues Percentage of variance explained Cronbach's Alpha	3.842 64.034 0.883
Perseverance (1-5 scale from strongly agree to strongly disagree)	
27. When I am faced with technology related problem that I cannot solve immediately I stick with it until I solve it.	.698
28. Once I start trying to work on a study related with technology, I find it hard to stop.	.643
29. When a question left in the use of technology, I will keep on thinking about it.	.766
30. I am challenged with the problems in the use of technology I cannot understand immediately.	.499
Eigenvalues Percentage of variance explained Cronbach's Alpha	2.607 65.167 0.819
Interest (1-5 scale from strongly agree to strongly disagree)	
31. Figuring out technology problems does not appeal to me.	.751
32. The challenge of technology related problems does not appeal to me.	.763
33. The use of technology is boring.	.443
34. I don't understand how some people can spend so much time to use technology and seem to enjoy it.	.559
35. I would rather have someone give me an answer of technology related problems than to solve it by myself.	.653
Eigenvalues Percentage of variance explained Cronbach's Alpha	3.169 63.376 0.853
Anxiety (1-7 scale from strongly agree to strongly disagree)	
36. Learning a software package	.563
37. Using a computer	.689
38. Programming a video recorder (e.g., VCR, DVD)	.385
39. Using a mobile phone	.635
40. Learning about computers	.532
41. Using video conferencing	.572
42. Using Internet	.726
43. Computer technology is changing very quickly	.541
44. Reading a computer manual	.639
Eigenvalues Percentage of variance explained Cronbach's Alpha	3.994 44.373 0.832

3.2 Survey and Student Profile

The actual survey was conducted by distributing the questionnaires to the respondents during the lectures. The questionnaire was generally completed within 20 minutes. Thus, 350 questionnaires were distributed to students and, finally, 211 questionnaires were returned with a return rate of 60.29%. The usability rate was 100% as no incomplete questionnaires were found.

Descriptive statistics were used to analyze the demographic data on respondents. Table 2 displays the demographic data on respondents.

Of the questionnaire returned, 51.7% were completed by males and 48.3% were completed by females. 35.1% of respondents were under age 21, 58.3% of respondents ranged between 21 and 25, 4.7% of respondents ranged between 26 and 30, 1.9% of respondents ranged between 31 and 35. 28.4% of respondents were year 1 students, 35.5% were year 2 students and 36% were year 3 students. In addition, 85.8% were full time students, 13.3% were part time students and 0.9% were exchange students.

Table 2 – Statistics of the personal data of respondents

Personal Details	No. of respondents	Percentage of respondents (%)
Gender		
Male	109	51.7
Female	102	48.3
Age		
< 21	74	35.1
21-25	123	58.3
26-30	10	4.7
31-35	4	1.9
Year of Study		
Year 1	60	28.4
Year 2	75	35.5
Year 3	76	36.0
Mode of study		
Full time	181	85.8
Part time	28	13.3
Exchange	2	0.9

3.3 Validity and Reliability Tests

In this study, the statistical tool of AMOS was used. To confirm the construct of the questionnaire is valid and reliable, the validation of the measurement construct was examined. Firstly, the Cronbach's alpha was used to measure the reliability of each construct. Cronbach's alpha is a single correlation coefficient and it estimates the average of all the correlation coefficients of the items (Robert, 2006). The recommended cutoff criterion of the scale is 0.7 (Fornell and Larcker, 1981). Thus, if the Cronbach's alpha of the items is higher than 0.7, all of the items are reliable and the scale is internally consistent. From Table 1, the Cronbach's alpha values of eight constructs "confidence", "perceived personal ability", satisfaction", social influence", relevance", perseverance", "interest" and "anxiety" were 0.866, 0.920, 0.803, 0.833, 0.883, 0.819, 0.853 and 0.832 respectively. As no alpha value in this survey study was less than 0.7, the results were considered to be consistent and reliable.

In additional to the Cronbach;s alpha, a factor analysis using varimax rotation was also performed as it typically produces an orthogonal set of interpretable dimensions (Kaiser & Coffrey, 1965; McDermeit, Funk, Foss, & Dennis, 2000). The factors with eigenvalues larger than 1 should be retained because an eigenvalue less than 1 implies the scores on the component would have negative reliability (Cliff, 1988; Kaiser, 1960; Zwick & Velicer, 1986). Factor loadings of less than 0.3 were omitted as it is accepted that only factor loadings on the attributes greater than 0.3 were suitable for interpretation (Fornell and Larcker, 1981).

The results of factor loadings, eigenvalues and percentage of variance explained are shown in Table 1. For the 5 items of confidence, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 68.788% of total variance; factor loadings ranged from 0.0.516 to 0.774. For the 5 items of perceived personal ability, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 75.863% of total variance; factor loadings ranged from 0.734 to 0.801. For the 5 items of satisfaction, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 57.619% of total variance; factor loadings ranged from 0.338 to 0.707. For the 5 items of social influence, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 60.170% of total variance; factor loadings ranged from 0.440 to 0.742. For the 6 items of relevance, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 64.034% of total variance; factor loadings ranged from 0.460 to 0.735. For the 4 items of perseverance, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 65.167% of total

variance; factor loadings ranged from 0.499 to 0.766. For the 5 items of interest, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 63.376% of total variance; factor loadings ranged from 0.443 to 0.763. For the 9 items of anxiety, all factor loadings were greater than 0.3 and only one factor had an eigenvalue greater than 1. This single factor accounted for 44.373% of total variance; factor loadings ranged from 0.385 to 0.726.

Discriminant validity was also conducted using correlation analysis. According to Table 4.4, the correlations among eight constructs are less than 0.85. It is concluded that the discriminant validity exists between the constructs (John & Benet-Martinez, 2000).

Confirmatory factor analysis was then conducted using AMOS version 18 to establish a model with the closest fit to the data (Hu and Bentler, 1999). The resulting model contained 44 items. The overall model suggests good fit according to the standards set forth by Hu and Bentler (1999) (chi-square of 503 with 360 degrees of freedom; SRMR = 0.069; RMSEA = 0.050; CFI = 0.96).

4. RESULTS

4.1. Means and standard deviations

The means and stand deviations of eight constructs are shown in Table 3.

Table 3- Means and standard deviations of eight constructs

Construct	Mean	Standard deviation
Confidence	2.85	0.85
Perceived Personal Ability	2.69	0.92
Satisfaction	2.23	0.72
Social influence	2.25	0.71
Relevance	2.08	0.73
Perseverance	2.96	0.85
Interest	2.86	0.86
Anxiety	5.18	0.85

4.1.1 Confidence

The mean value of confidence is 2.85. The mean value approached to disagree in the Likert scale used. The mean value implied that engineering students tended to be lack of confident in using technology for learning. In addition, some students were lack of confidence when they learnt the software programming courses because they could not get higher marks in those courses.

4.1.2 Perceived personal ability

The mean value of perceived personal ability is 2.69. The mean value was near to neutral in the Likert scale used. The mean value implied that engineering students had no idea about their personal abilities to use technology for learning.

4.1.3 Satisfaction

The mean value of satisfaction is 2.23. The mean value was near to neutral in the Likert scale used. The mean value implied that engineering students tended to be satisfied in using technology for learning.

4.1.4 Social influence

The mean value of social influence is 2.25. The mean value was near to neutral in the Likert scale used. The mean value implied that engineering students tended to be influenced by their classmates when they used technology to learning.

4.1.5 Relevance

The mean value of satisfaction is 2.08. The mean value approached to agree level in the Likert scale used. The mean value implied that engineering students considered using technology were important, useful and relevant to their goals or life.

4.1.6 Perseverance

The mean value of perseverance is 2.96. The mean value approached to disagree level in the Likert scale used. The mean value implied that engineering students tended to lack of perseverance in using technology for learning. Since there are many programming courses in the engineering programmes, students found difficulty in learning such programming technology.

4.1.7 Interest

The mean value of perseverance is 2.86. The mean value approached to disagree level in the Likert scale used. The mean value implied that engineering students tended to lack of interest in using technology for learning. Since there are many programming courses in the engineering programmes, students found difficulty in learning such programming technology and eventually they lost interest in learning the relevant subjects.

4.1.8 Anxiety

The mean value of anxiety is 5.18. The mean value approached to disagree level in the Likert scale used. The mean value implied that engineering students tended to be fear in using technology for learning. The reason was that they were fear to learn programming courses, students found difficulty in learning such programming technology and eventually they were fear in learning the relevant subjects.

4.2 Correlations among motivation components

The correlation analysis was conducted to test the relationships among eight hypotheses. Table 4.4 shows the results.

Table 4.4 - Correlations among the Motivation components

Relationship	Pearson Correlation	Result
H1: Relevance-Confidence	.383**	Supported
H2: Confidence-Satisfaction	.238**	Supported
H3: Satisfaction-Relevance	.523**	Supported
H4: Relevance-Interest	.421**	Supported
H5: Confidence-Perceived Personal Ability	.794**	Supported
H6: Confidence-Perseverance	.649**	Supported
H7: Confidence-Anxiety	-.470**	Supported
H8: Satisfaction-Social Influence	.467**	Supported

** Correlation was significant at the 0.01 level (p<.01, two-tailed).

4.2.1 Relationships among Relevance, Confidence and Satisfaction

There were closely relationships among Relevance, Confidence and Satisfaction in ARCS model and each motivation components would affect each other (Keller, 2010). Pearson's correlation coefficients indicated positively significant relationship between relevance and confidence (r=.383, p<.01), confidence and satisfaction (r=.238, p<.01), satisfaction and relevance (r=.523, p<.01). These findings were supported by Oliver & Reeves (1996) and Wenhao et al (2006). Thus, the hypotheses H1, H2 and H3 were supported.

4.2.2 Relationship between Relevance and Interest

The Pearson's correlation coefficients indicated that there was positive and significant relationship between relevance and interest (r =.421, p<.01). This finding was supported by David, Jon, Matthew (1995) and Hidi & Baird (1986). Therefore, the hypothesis H4 was supported.

4.2.3 Relationships among confidence and perceived personal ability, perseverance, anxiety

There were significant positive relationship between confidence and perceived personal ability(r =.794, p<.01), and perseverance (r =.649, p<.01). On the other hand, a significant negative relationship between confidence and anxiety (r = -.470, p<.01). These findings were supported by Agatha and Don (2008) , Ashton & Webb (1986), Bandura, 1997), Korobili, Togia , Malliari (2010), Nichols & Miller (1994), Paula, Nicole , Samantha , Brendan (2008), Woolfolk & Hoy(1990) and Weiner (1992, 1974). Hence, the hypotheses H5, H6 and H7 were supported.

4.2.4 Relationship between Satisfaction and Social Influence

There was a significant positive relationship between satisfaction and social influence (r =.467, p<.01). This finding was supported by Lee, et al (2003) and So & Brush (2008). Thus, the hypothesis H8 was supported.

5. DISCUSSION

Generally speaking, engineering students were motivated to learn to use the technology in targeted university under study. The reason was that the university provided proper and sufficient educational technology in campus such as computers, laptops and software. Since 2005, the targeted university under study created an e-learning environment for engineering students to use technology for learning effectively. Moreover, an e-learning platform provided rich learning resources for engineering students in order to encourage them for proactive learning such as library database (Zoey, 2009). In addition, engineering students use the technology everyday, which can build up their confidence in the use of technology. For example, teacher will upload the course

materials on the blackboard and students download the materials through the blackboard and they would check email every day; they would usually use the MS Office to accomplish the projects or assignments; they would search information. Extensive research found that the use of technology could motivate student in learning and provided an effective learning environment to them such as Internet (Blanche & Kathleen, 2010; Langin, Ackerman & Lewark, 2004), online course (Kyong-Jee, Shijuan & Curtis, 2005), blackboard (Lang, 2008), discussion board (Clyde, William, Andrew, 2004; Lang, 2008), email (Clyde, William & Andrew, 2004), library database (Clyde, William & Andrew, 2004), MS Word , Excel, PowerPoint (Lawrence & Tomei, 2003), Laptop (Chuleeporn, Robert, Susan, 2008) etc. Therefore, engineering students have positive attitude towards the use of technology and they were motivated to use it for learning based on the e-learning environment created by university. However, the engineering students were not motivated to learn programming languages. The students found difficultly in learning programming languages and they could not get high marks in those courses. Although the students enjoyed in using the high technology facilities provided by university, they could not enjoy the software programming courses offered by departments.

From the results, all hypotheses H1 – H8 were supported since there were significant relationships among motivational components. Firstly, there were significant positive relationships among Relevance, Confidence and Satisfaction. Past studies revealed that there were significant relationship among Relevance, Confidence and Satisfaction (Wenhao et al, 2006). In this study, this finding indicated that engineering students perceived using technology was relevant to their life and future jobs. As a result, they were willing to learn the application technology provided by university. Also, when they were confident in the use of technology, they tended to be more satisfied in using technology for learning. Furthermore, when they achieved a desirable level of success in the use of technology for relevant purposes, their level of satisfaction was relatively high.

Secondly, there was significant positive relationship between Relevance and Interest (Keller, 2010). This finding was also consistent with David, Jon, Matthew (1995) and Hidi & Baird (1986). David, Jon, Mattew (1995) found that there were strong positive relationship between relevance and interest. Hidi & Baird (1986) pointed out that students had the highest recall for the interesting content, which was interested to them or personal meaningful to them. This relationship indicated that engineering students interested with the use of technology that related to their personal goals or life.

Thirdly, with respect to the relationship between confidence and perceived personal ability, the positive relationship was obtained. This finding was consistent with Ashton & Webb (1986) and Woolfolk & Hoy (1990). They indicated that when students believed that they were able to use the technology, their level of confidence would be relatively high. Moreover, they found that students were more confident in learning if they could learn the strategies and skills which helped them achieve their goals. Therefore, engineering students were more confident if they had higher perceived personal ability of using technology. Bandura (1997) pointed out that people with higher self-efficacy would be more perseverance in facing with obstacles. In this study, more engineering students insisted in the use of technology when faced with problems. Thus, the relationship between confidence and perseverance existed. Regarding the relationship between confidence and anxiety, negative relationship was observed. This finding was consistent with Agatha and Don (2008), Bandura (1997), Korobili, Togia , Malliari (2010) and Paula, Nicole, Samantha, Brendan (2008). Based on the attribution theory (Weiner, 1992; 1974), people who had confidence in their ability would not see the task that was difficult and their level of anxiety would be relatively low. In this study, engineering students who were more confident towards educational technology, they were less anxiety with the use of technology. Therefore, the negative relationship existed between confidence and anxiety.

Finally, the positive relationship between satisfaction and social influence was found. The finding was consistent with Lee et al (2003) and So & Brush (2008). Previous research found that the extent of social influence would affect the degree of satisfaction in the use of technology (Lee et al, 2003). As a result, students might change their attitude towards the use of technology when cooperating with others (Lee et al, 2003). In this study, engineering students had positive attitude towards social influence in the use of technology and their satisfaction levels were relatively high.

6. CONCLUSION

In conclusion, the students' perception of the use of technology for learning have been examined and the motivational factors and personal characteristics have been identified and the relationship among the motivational components was found. The new research model had been developed and this was the major contribution of this study. The major implication of this study is that the top management of the targeted university under study and educators can provide different supports for different group of engineering students and design the instructional strategies based on the engineering students' motivation.

There are some limitations and future research opportunities. The main limitation of this study was the narrow range of the age group. As the age ranges are from less than 21 to less than 35 but no participants aged higher than 35. It is not enough to compare the difference between the older and younger students in the use of technology. When the age range becomes wider, the difference becomes more valid. The second limitation is the small sample size and only engineering students of one university were invited in this study.

There are some future research opportunities for this study. Firstly, additional research is needed to evaluate the validity of the research model and the modified FSMAS. As the model and the modified FSMAS were new, further examination was needed to investigate students' perception in the use of technology and the relationship among the motivational components. Secondly, this study only examined engineering students at targeted university under study about the use of technology for learning. This study can be applied to other faculties, other universities, secondary schools or other countries for further research.

REFERENCES

Agatha M.Conrad & Don. Munro. (2008). Relationships Between Computer Self-Efficacy, Technology, Attitudes and Anxiety: Development of the Computer Technology Use Scale (CTUS). *Journal of Educational Computing Research, 39*(2), 51-73.

Andrew K.Lui, Yannie H.Y.Cheung, Reggie Kwan.(2005). Social Capital Creation and Reciprocity in Online Learning Platforms. *Web-Based Learning: Technology and Pedagogy : Proceedings of the 4th International Conference,165-174.*

Ashton, P., & Webb, R. (1986). *Making a difference: Teachers' sense of efficacy and student achievement.* New York: Longman.

Bandura, A. (1997). *Self-efficacy: The exercise of control* (Vol. ix). New York: W. H. Freeman/Times Books/Henry Holt & Co.

Blanche W.O'Bannon & Kathleen Puckett. (2010). *Preparing to Use Technology: A Practical Guide to Curriculum Integration.* Pearson.

Changchit, Chuleeporn, Robert Cutshall, and Susan Elwood.(2008). Perceptions of Laptop Initiatives: Examining Determinant Factors of University Students for Successful Implementation. *Adapting Information and Communication Technologies for Effective Education.* Ed. Lawrence Tomei. Hershey, PA: Information Science Reference, 2008. 88-99. Advances in Information and Communication Technology Education Series (AICTE). *Gale Virtual Reference Library*. Web. 20 Feb. 2011.

Cliff, N. (1988). The Eigenvalues-Greater-Than-One Rule and the Reliability of Components. *Psychological Bulletin, 103*(2), 276 – 279.

Clyde, William Delohery, Andrew.(2004). *Guide to Classroom Technology for Mainstream Faculty.* Yale University Press.

Daniel,P.C., Amber ,D.L., Kevin, R.G.(2010). Engaging Onling Learners: The Impact of Web-based Learning Technology on College Student Engagement. *Computers & Education, 54*, 1222-1232.

David,S.B.,Jon,A.K.,Matthew,K.B. (1995). Origins of Attitude Importance: Self-Interest, Social Identification, and Value Relevance. Journal of *Personality and Social Psychology, 68* (1), 61-81.

Dempsey, J. V. & Johnson, B. (1998). The development of ARCS gaming scale.*Journal of Instructional Psychology,25*, 215–221.

Fornell, C. and Larcker, D (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing research* Vol.15,pp.282-388.

Hidi, S., & Baird, W. (1986). Interestingness—A neglected variable in discourse processing. *Cognitive Science, 10*(2), 179.

Hu LT, Bentler PM. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives. Structural Equation Modeling, 6(1): 1-55.

Jennefer Clark.(2008). PowerPoint and Pedagogy: Maintaing Student Interest in University. *College teaching, 56*(1), 39-45.

John, O.P., & Benet-Martinez, V. (2000). Measurement: Reliability, construct validation, and scale construction. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social psychology*, pp. 339-369. New York: Cambridge University Press.

Kahveci Murat. (2010). Student's Perceptions to Use Technology for Learning: Measurement Integrity of The Modified Fennema-Sherman Attitudes Scales. *The Turkish Online Journal of Educational Technology*, 9 (1) , 185-201.

Kaiser, H.F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*, 141 – 151.

Kaiser, H.F., & Coffrey, J. (1965). Alpha factor analysis. *Psychometrika, 30*, 1-14.

Keller, J. M. (1984). The use of the ARCS model of motivation in teacher training. In K. S. A. J. Trott (Ed.), *Aspects of educational technology volume XVII: Staff development and career updating.* London: Kogan

Page.
Keller, J. M.(1987), Development and use of the ARCS model of instructional design. *Journal of Instructional Development*, 10(3) , 2-10
Keller, J. M.(2010). *Motivational Design for Learning and Performance.* Springer
Klein, J. D. & Freitag, E. (1991). Enhancing motivation using an instructional game. *Journal of Instructional Psychology*, *18*, 111–117.
Korobili, S., Togia, A., Malliari, A. (2010). Computer Anxiety and Attitudes among Undergraduate Students in Greece. *Computers in Human Behavior, 26*(3), 399-405.
Kyong-Jee Kim, Shijuan Liu, Curtis J. Bonk.(2005). Online MBA students' perceptions of online learning: Benefits, challenges and suggestions. *Internet and Higher Education, 8*(4) , 335-334.
Lawrence A. Tomei (2003) *Challenges of teaching with technology across the curriculum: issues and solutions.* Hershey, PA : Idea Group Publishing.(P.25-70)
Lang, James M.(2008). On Course : A Week-by-Week Guide to Your First Semester of College Teaching. *Harvard University Press.*
Langin.D.W. , Ackerman.P.A. and Lewark.S. (2004). Internet-based learning in higher forestry education. *Unasylva ,216* (55), 39-44.
Lee,J.-S.,Cho,H.,Gay,G.,Davidson,B.,& Ingraffea,A.(2003).Technology Acceptance and Social Networking in Distance Learning. *Educational Technology & Society,6*(2),50-61.
McDermeit, M., Funk, R., Foss, M., & Dennis, M. (2000). *Exploratory Factor Analysis with alpha method and varimax rotation. LI Analysis Training Series.* Retrieved on 5 April 2011 from: http: //www.chestnut.org/LI/downloads/training_memos/factor_analysis.pdf.
Nichols, J. D., & Miller, R. B. (1994). Cooperative learning and student motivation. *Contemporary Educational Psychology, 19*, 167-178.
Oliver, R., & Reeves, T. C. (1996). Dimensions of effective interactive learning with telematics for distance education. *Educational Technology Research and Development, 44*(4), 45-56.
Paula M. Popovich, Nicole Gullekson, Samantha Morris, Brendan Morse. (2008). Comparing attitudes towards computer usage by undergraduates from 1986 to 2005 . *Computers in Human Behavior,* 24(3), 986-992.
Reber, A. (1985). *Dictionary of psychology.* London: Penguin Books.
Robert,Ho(2006). *Handbook of Univariate and Multivariate Data Analysis and Interpretation with SPSS.* Boca Raton, FL, USA: CRC Press.
Ronnie C.T.Cheung.(2005). An On-line Programming Environment with Automated Assessment. *Web-Based Learning: Technology and Pedagogy : Proceedings of the 4th International Conference, 145-154.*
Saloman, G. (1984). Television is ''easy'' and print is ''tough'': The differential investment of mental effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology, 76*(4), 647-658.
Schank, R. C. (1979). Interestingness: Controlling inferences. *Artificial Intelligence, 12*(3), 273¯297.
So,H.J. & Brush,T.A. (2008) Student Perceptions of Collaborative Learning, Social Presence and Satisfaction in a Blended Learning Environment: Relationships and Critical Factors. *Computers & Educatioin, 51*, 318-336.
Weiner, B. (1992). *Human motivation*. Newbury Park: Sage Publications.
Weiner, B. (Ed.). (1974). Achievement motivation and attribution theory. Morristown, NJ: General Learning Press.
Wenhao Huang, Wenyeh Huang, Heidi Diefes-Dux and Peter K. Imbrie.(2006). A preliminary validation of Attention, Relevance, Confidence and Satisfaction model-based Instructional Material Motivational Survey in a computer-based tutorial setting. *British Journal of Educational Technology, 37*(2), 243-259.
Woolfolk, A., & Hoy, W. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, 82,81-91.
Zoey Tsang. (2009). CityU promotes e-Learning at Asia forum. Adapted from CityU News Center. http://www6.cityu.edu.hk/puo/CityUMember/Story/Story.aspx?id=20090512150310
Zwick, W.R., & Velicer, W.F. (1986). Comparison of Five Rules for Determining the Number of Components to Retain. *Psychological Bulletin, 99*(3), 432 – 442

Improving College Students English Learning with Dr. Eye Android Mid

Ju Yin Yang
Kainan University, Taiwan
irenesandiego@mail.knu.edu.tw

Pei-Chun Che
National Chengchi University, Taiwan
pcche@nccu.edu.tw

ABSTRACT
This paper investigates college students' English language learning through use of Dr.eye Android handheld mobile Internet device (MID). Compared to related studies, students' English learning using MIDs has not been evaluated and fully understood in the field of higher education. Quantitatively, the researchers used TOEIC pretest and posttest to collect and analyze students' English performance; qualitatively, semi-structured group interviews were used to investigate student perspectives on using MIDs in learning English. Thirty-three participants completed a three-month intensive English course aiming to improve their English proficiency. The context of the tasks included collaborative development, general business, entertainment, finance and budgeting, manufacturing, and purchasing. Each task needed to be completed using the MID in class with instructions. Finally, ten participants participated in the semi-structured group interview. Results indicated that learning with an appropriate context designed in combination with the use of an MID yielded a significant improvement. The result showed that the educational background and teaching experience of the instructor was also a significant factor, as the quality of the instruction had a significant influence on student learning outcomes. This paper ends with further focus on the importance of using Bring Your Own Device activities (BYOD) in language learning and teaching.

Keywords: Dr. Eye Android MID, mobile learning, Learning Performance

INTRODUCTION
Line, blog, and Facebook are the top three ways of sharing information for college students. When teachers teach lessons in the classroom, a few students are capable of looking for further information for teachers' assignments, texting messages, browsing the Internet, tagging them on Facebook, or checking emails according to their needs. While doing so, students need the latest mobile devices that have access to the Internet. And the phrase "Shake-Shake your cell phone" refers to how young people use this Line function to look for their friends and share information they find. As a result, these latest mobile devices are accepted and infiltrated by college students as a common tool of daily activities (Dennen & Hao, 2014; Yakin, Turkey, Tinmaz, Turkey, 2013). Hence, mobile devices have a significant impact on students' lives, not only for building social relationships with others, but also enhancing academic learning. According to an Executive Yuan project in the year of 2011 which investigated "the Opportunities of Using the Handheld Mobile Phones in Taiwan," almost 90.7% of the population, particularly those who have earned college degrees, use handheld mobile devices to browse the Internet or search for information, 78.5% use the map functions of these devices, 77.1% access social networks or MSN via mobile devices, 68.6% use mobile devices to send pictures or files, and 59.4% use mobile devices to check their email (Executive Yuan, 2011). This result shows there are strong reasons behind utilizing mobile devices to facilitate the information obtaining and learning in daily life. With the advance of technology, mobile devices allow people to learn "what, when, where, and how they want" (Sandgern, Maris, & de Geus, 2011, p.1134). Moreover, more teachers have shown great enthusiasm for incorporating "bring your own device" (BYOD) activities in the classroom as a part of teaching and learning (Shroff, Deneen & Ng, 2011, Lim, Zhao, Tondeur, Chai, & Tsai, 2013). According to Education First (2013), the overall English proficiency of Taiwan's population is much lower than other countries, such as India, Hong Kong, Japan, Korea, and Vietnam. In fact, referring back to higher education in Taiwan, the amount of time for learning English is extremely limited. If college students who are not English majors, their English instruction time will normally be two hours a week. For teachers, it is a great challenge to improve students' English in such a short time. Thus, in order to make learning and teaching more effectively and overcome these time constraints, many universities in Taiwan have started to use the latest technological devices to solve the problems. Meanwhile, Kim, Rueckert, Kim, & Seo (2013) indicated that mobile technologies could help learners to learn class content and join classroom activities in a collaborative way. Integrating mobile devices with course content can "create a virtual learning environment that offers not only content management and but also an innovative teaching method that can increase the active role of the student in the classroom" (Dogoriti & Pange, 2012, p.25). However, studies about the use of MID in higher education are limited. Therefore, Dr. eye was chosen to be used in this study to examine to what extent

the handheld mobile device can be used for improving Taiwan's college students' English. At the same time, researchers wish to understand students' perspectives regarding the use of Dr.eye handheld mobile device for language learning and learning English with native speakers who do not use Mandarin at all.

THEORETICAL BACKGROUND

Mobile Device Use in Higher Education

Nowadays, accompanied with the latest technological innovations, language learning and teaching methods have changed dramatically, particularly by adding mobile devices into the classroom. Undoubtedly, it is becoming increasingly clear that mobile devices have played an important role enhancing teaching and learning outcomes in higher education (Chang *et al*., 2003, Ting, 2005, Kuo & Wu, 2013). Hence, more and more APPs that can be used on mobile devices, such as laptops, smartphones, PDAs, mobile phones, and hand-held devices have been developed for educational usage (Mcconatha, Prual, & Lynch, 2008). In addition, according to Lim, Zhao, Tondeur, Chai, & Tsai (2013) "technology-mediated learning environments provide opportunities for students to search for and analyze information, solve problems, communicate, and collaborate" (p.59). Mobile devices have changed and improved personal contact, learning behaviors, classroom practices and learning processes in 28 countries in Asia, Africa, Europe, North America, and South America (Law, Pelgrum, & Plomp, 2008). They also help learners to learn wherever and whatever they want (Sandberg, Maris, de Geus, 2011, p.1334) and create opportunities for learners with mobile devices to practice anytime and anywhere (Demouy & Kukulska-Hulme, 2010). Kukulska-Hulme (2009) mentioned "mobile technology can assist learners at the point of need and in ways that fit in with their mobile lifestyles" (p.162). To sum up, to create an authentic language environment, technology can play an important role (Chen, Yang, 2014). Table 1 states some relevant researches on how mobile devices can support English learning in higher education according to the needs and interests of students according to the chronological order.

Table 1: Relevant Researches in Usage of Mobile Devices in Higher Education

Authors	Related Researches	Sources
Cheverst, Davies, Mitchell, & Friday (2000)	Experiences of developing and deploying a context-aware tourist guide: the GUIDE project	Lancaster University
Thornton & Houser (2005)	Using mobile phones in English Education in Japan	Journal of Computer Assisted Learning
Al-Fahad (2009)	Students' attitudes and perceptions toward the effectiveness of mobile learning in King Saud University	The Turkish Online Journal of Educational Technology
Liu (2009)	A context-aware ubiquitous learning environment for language listening and speaking	Journal of Computer Assisted Learning
Liaw, Hatala &Huang (2010)	Investigating acceptance toward mobile learning to assist individual knowledge management: based on activity theory approach	Computers & Education
Huang, Hwang, &Chang (2010)	Innovations in Designing Mobile Learning Applications	Educational Technology &Society
Chen & Lin (2010)	Personalized context-aware ubiquitous learning system for supporting effective English vocabulary learning	Interactive Learning Environments
Kuo (2012)	Research of Fitness English Learning in a Situational Ubiquitous Learning Environment with a Focus on Reading Comprehension	National Cheng Kung University

Social Constructivist Learning Theory in Language Learning

Social constructivist learning theory states that "positive social interaction can instigate intellectual growth" among instructors, learners, learning environments, course content, and activities (Piaget, 1965). Learning also should take place in a real context where students get involved with others. The role of the instructors should be the facilitator in classroom teaching, while students are able to construct their previous knowledge and integrate the new knowledge with the proper assistance of instructors. Meanwhile, based on Dewey (1916), it is stated that there are three factors in the design of classroom materials: learners, society, and knowledge. A meaningful material design should meet instructors' knowledge, students' needs, and industry expectations in the real workplace. Because of this, social constructivist theory has been popularly used in language learning. Williams and Burden (1997) emphasize three factors: (1) Learners should have a sense of constructing the language meaning and process the knowledge with the help of the instructors, (2) language learning aims to develop learners' thought processes and relationship-building through utilizing the target language, and (3) learners are capable of completing any new tasks with the appropriate cognitive levels.

METHODOLOGY

Research Design

This study employed a mixed research method and explanatory design to examine college students' English learning performance. Quantitative data were gathered from the pretest and posttest using the formal TOEIC examination; the qualitative data were obtained from semi-structured group interviews with 10 students, the TOEIC Learning Achievement Platform, and classroom observation. The TOEIC Learning Achievement Platform recorded the teaching time of every class, and data was collected to aid in the explanations of the quantitative data results.

Research Questions

The study was designed to focus on the following research questions

1. Does the use of Dr.eye Android Mobile Internet Device in intensive English learning create greater improvement on specific TOEIC materials?
2. What are students' perspectives about using Dr.eye Android Mobile Device in English learning?
3. What are students' perspectives about learning English with a native speaker?

Participants

As shown in Table 2, participants included 33 college students (9 males and 24 females) from various departments in different colleges of Kainan University, Taiwan. They were from the same first language background: Traditional Chinese or Mandarin. Their ages ranged from 20 to 32 with an average mean of 22. The majority of participants have studied in this university for more than two years. 31 participants have used their phones to learn English and five participants have heard of Dr. eye MID (See Table 3). 18 participants volunteered to take this intensive course because they wanted to improve their English (See Table 4). This course was called 'TOEIC Talent 990' and all participants must have reached a TOEIC score of at least 400 before they applied for this course. The design of this class emphasized quality rather than quantity. The researchers hope to provide the well-quality learning environment to students. That is the reason why the TOEIC score standard was set for students to attend this class.

Table 2: Majors and Genders of the Participants

Majors	AE	L	T&HM	IB	PA&M	Total
Male	4	0	1	3	1	9
Female	10	6	5	1	2	24
Total	14	6	6	4	3	33

Note: AE stands for Applied English; L is Law; T&HM Tourism and Hospitality Management; IB is International Business; and PA&M is Public Affairs and Management

Table 3: Experience Using Mobile Devices to Learn English

Questions	Responses of Learners		
	Yes	No	Others
7. Have you ever used any mobile device/smartphone to learn English?	31	2	0
8. Have you ever heard about Dr.eye?	5	28	0

Table 4: Reasons for Attending this Course

Questions	Responses of Learners		
	Free course	Free Phone	Improve English
9. Why do you want to this Intensive English course? (Pick only one answer)	9	6	18

Subject Teacher, Language Teacher & Industry

The teaching staff of this intensive course included two researchers who are subject teachers (ST) in a business administration-related field and linguistic field and a language teacher (LT) who has a background in Teachers of English to Speakers of Other Languages (TESOL) from Australia. All of them mainly offered ESP courses for students of business, tourism, science, and languages. Moreover, it should be mentioned that ESP courses in Taiwan are mainly taught by subject teachers, while language teachers only focus on language training courses. Furthermore, ESP courses are usually not tailor made for industry needs. However, in this study, Chun Shin representatives (CSR) joined the regular meetings with subject teachers and the language teacher (See Table 5). In order to make the teaching materials and activities more pragmatic, the three parties worked together to decide on the teaching methodology, supplemental materials, classroom tasks, and evaluation for students.

Table 5: Demographic Background Information

Title	Gender	Major	Degree	Teaching ESP
ST1	F	TESOL	E.d.D.	General Business/ International
		Business	M.A.	Trade Business/ Tourism
ST2	F	Linguistics	P.h.D.	Business English/Culture & Tourism
LT	M	TESOL	M.A.	Tourism/ TOEIC
CSR 1	M	English	M.A.	TOEIC/Technology
CSR 2	F	Information	M.A.	Technology

Data Collection & Procedures

TOEIC Talent 990 was arranged for one semester. The researchers spent three months promoting this intensive course for all Kainan students. It was a cross-disciplinary research project involving Kainan University, Inventec Cooperation, and Chun Shin Limited. The data collection took place from the months of March to May 2011. This study aimed to allow schools, businesses, and test examination companies to understand how technology is involved in English learning. Students were required to take the pretest and posttest to examine their English performance. All participants were given a free Dr.eye MID at the beginning of this intensive course. The processes of data collection were planned as follows: the pretest was given in March at the beginning of the course along with the background information questionnaire- for all participants. The posttest was given at the end of the course on May 31, 2011.And students' group interviews were conducted at the end of the course in June 2011. The pretest and posttest were provided by the official ETS examination company, Chun Shin Limited. In addition, the researchers randomly selected 10 students and divided them into two groups. The first interview process took one hour and twenty-five minutes and the second took one hour and ten minutes. The average interview time of this study was seventy-eight minutes. The reason for conducting students' group interviews was to allow for a better understanding of how students with various proficiency levels use Dr.eye MID in English learning. Most of participants (N=31) have had experience using mobile devices for learning English, thus it wasn't difficult for participants to use Dr.eye. Additionally, the company also held a training session for teachers and students to learn how to use this device.

The Materials

In order to improve students' learning performance, the course materials were developed by the STs, LT, and CSRs. The course materials were divided into two types: paper-based content and Dr.eye MID content (see Table 6). The teaching materials were adapted from the textbooks *Complete Guide to the TOEIC TEST* (3rd Edition) by Bruce Rogers, New TOEIC (Focus on Grammar) by a team from Ivy Company, and self-developed sheets (activities, quiz, assignments, and extra reading materials), which were designed by the researchers and instructors. The details of the course materials were categorized by twelve items based on the ETS examination website (see Table 7). Additionally, the followings are installed in Dr.eye MID: three official TOEIC examinations provided free of charge by Chun Shin Limited, TOEIC frequency vocabulary practices, Wi-Fi wireless Internet, the Oxford Chinese/English Dictionary, and E-books/ games were developed by the Inventec Corporation.

Table 6: Types of Course Materials

Types	Paper-based	Dr.eye MID
Contents	Skill building exercises Grammar skill building Self-developed sheets (activities, quizzes, assignments, and extra reading materials) created by the researchers and instructors	Three official TOEIC examinations TOEIC frequency vocabulary exercises Wi-Fi wireless Internet Oxford Chinese/English Dictionary Learning Platform E-books/ games

Table 7: Twelve Items for Course Materials Contexts

Guideline of Material Contents Design for TOEIC Examination	
Dining out	Health
Entertainment	Housing/Corporate property
Finance & Budgeting	Manufacturing
Offices & Facilities	Personnel
Purchasing	Technical Areas
Travel	Planning

Instruments

The main instrument that is used in this study is Dr.eye Android Mobile Internet Device (MID). It is also called Dr.eye handheld Mobile Internet Terminal. It was developed by the Inventec Cooperation in 2009 with a QWERTY keyboard, a 4.8-inch VGA touchscreen, 3G, Wi-Fi, and a front-facing webcam (Stevens, 2010). Learners could do the installed TOEIC exercises by using this handheld mobile Internet device anytime and anywhere.

Official TOEIC Examination Pretest and Posttest

The TOEIC test is a two-hour multiple-choice test that consists of 200 questions divided into two sections: Listening and Reading. The Listening section tests how well testees understand spoken English. It consists of four parts with 100 questions. Students will be asked to answer questions based on a variety of statements, questions, conversations, and talks recorded in English. The Reading section includes three parts, testing how well testees understand written English. Students will read a variety of materials and respond to 100 questions based on the content of the materials (ETS, 2013).

TOEIC Learning Achievement Platform

Via TOEIC Learning Achievement Platform, the researchers, and the instructor could track students' individual learning progress such as the times they logged into the system, their exercise scores, and the test results.

Semi-structured Group Interview

The semi-structured group interview was conducted by the STs. The reason for using the group interview was to provide the students with a comfortable environment and space to talk freely about their viewpoints on using Dr.eye in the intensive TOEIC class. Specifically, researchers were interested in understanding students' perspectives in learning English using MID from different angles. Since students are from different departments, they may not be familiar with the subject teachers. Thus, compared with one-on-one interviews, the group interview could help them avoid the pressure of answering questions or directly confronting the interviewers. Interviewees were divided into two small groups (five students each) with students ranging in age from 20-32 years old. The groups differed in terms of major, language background, academic performance, and personal interest. These two groups of students are mixed up selection from all students. To avoid any misunderstandings between STs and interviewees, all questions were asked in Mandarin, the students' first language. Students could answer freely in either Mandarin or English.

Data Analysis

For analyzing the quantitative data, the paired-sample t-tests were adopted to see whether there was a significant improvement between the pretest scores and posttest scores in terms of using Dr.eye MID in students' language learning. Descriptive statistics method was used to analyze the background information. Moreover, for the qualitative data, the participants were asked open-ended questions by the researchers. The data was then coded by the following four theme based items: self-examination for Dr.eye MID, English learning with Dr.eye MID, and practice outside of the class with Dr.eye MID, and suggestions for this course.

RESULTS

Students' learning performance was analyzed by using the TOEIC official examination, and interview data was used to understand student motivations for using Dr.eye Android MID in English learning.

Results of Research Question 1: Does the use of Dr.eye Android Mobile Internet Device in intensive English learning create greater improvement on specific TOEIC materials?

A paired-samples t-test was conducted to understand whether there was significant improvement after receiving the specific intensive English course training using the Dr.eye MID (see Table 8). The results found that there was a significant improvement in the scores on the pretest (M=498.33, SD= 95.90) and posttest (M= 545.90, SD= 124.85); (t (32)= -5.716, P=.000, see Table 8), respectively. Table 9 compares scores across various departments. All 33 students improved their TOEIC scores shown on their posttest, of which males improved their scores from 538 to 618 and females from 483 to 518. Specifically, the male students scored higher in posttest than female students in all five departments: English, Law, Tourism and Hospitality Management, International Business, and Public Affairs and Management (see Table 9). This result challenges the idea that female students usually perform better than male students in language learning. Regardless, it is clear that appropriate course materials design along with the aid of mobile devices truly facilitated students' English learning.

Table 8: Paired Samples Statistical Information

	Mean	N	Std. Deviation	Std. Error Mean
Pretest	498.333	33	95.90577	16.69505
Posttest	545.9091	33	124.85901	21.73516

Table 9: Results of Paired Samples t-Test for pretest and posttest scores

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pretest-Posttest	-47.57576	47.81346	8.32325	-5.716	32	.000

P<.05*

Table 10: Learning Performance by Department and Gender (N=33)

Departments	Genders	Mean	Pretest	Posttest
English		Mean	514.00	636.25
		N	4	4
		SD	90.55385	170.458
	Female	Mean	500.50	545.50
		N	10	10
		SD	116.367	119.034
	Total	Mean	511.785	571.428
		N	14	14
		SD	107.749	135.368
Law	Female	Mean	465.00	490.00
		N	6	6
		SD	30.822	39.242
	Total	Mean	465.00	490.00
		N	6	6
		SD	30.822	39.242
T&HM	Male	Mean	420.00	501.00
		N	1	1
		SD		
	Female	Mean	472.00	501.00
		N	5	5
		SD	67.878	56.612
	Total	Mean	463.333	488.33
		N	6	6
		SD	64.316	59.385
IB	Male	Mean	610.00	700.00
		N	3	3
		SD	151.575	227.870
	Female	Mean	575.00	585.00
		N	1	1
		SD		
	Total	Mean	601.250	671.25
		N	4	4
		SD	124.991	194.738
PA&M	Male	Mean	440.00	495.00
		N	1	1
		SD		
	Female	Mean	432.500	482.500
		N	2	2
		SD	10.606	17.677
	Total	Mean	435.500	486.666
		N	3	3
		SD	8.660	14.433
Total	Male	Mean	538.888	618.333
		N	9	9
		SD	117.067	181.968
	Female	Mean	483.125	518.750

	N	24	24
	SD	84.529	85.735
Total	Mean	498.333	545.909
	N	33	33
	SD	95.90577	124.859

Results of Research Question 2: What are students' perspectives about using Dr.eye Android Mobile Device in English learning?

Twenty open-ended questions were included in the semi-structured group interview to gain the in-depth insight into student viewpoints about using Dr.eye in the classroom practices and content module practices. There are four main categories listed as the following: (1) self-evaluation of the use of MID, (2) English learning with Dr.eye MID, (3) practice outside of class with Dr.eye MID, and (4) suggestions for the course (See Table 11).

Table 11: Summary of Students' Perspectives about Using Dr.eye MID

Category	Students Perspectives
Self- Evaluation	"I can practice TOEIC with my classmates instead of alone" "It is a useful tool for managing our own learning schedule" "I felt satisfied with checking my learning process" "It is meaningful to record the learning between classmates and myself" "'Awareness' is an important factor for language learning" "Although I got a 500 on the TOEIC, I still need more practice" "From this three month intensive training, I realize that practice makes perfect"
English Learning	"I use Dr.eye to record their learning, and help them to solve problems" "Various resources, high frequency vocabulary words, grammar, and TOEIC model questions are built in Dr.eye MID" "Model questions are the most useful function for students" (7 students responded); "Special Training Vocabulary is the most useful function for students" (3 students responded) "Daily Words with Japanese is the least useful function for students" (9 students responded) "This device is a good tool for learning English" "It is a valuable way for me to learn and experience a different way of learning English" "It improved my vocabulary. I can practice vocabulary when I am free" "The teachers add extra grammar exercises that are related to the business field" "The instructor integrates movies and MIDs into his teaching materials" All students will keep using Dr.eye to learn English
Practice Outside of Class with Dr.eye MID	"I am more willing to practice for TOEIC using Dr.eye MID" "It is easier to use the same device as other classmates" "The disadvantage of using Dr.eye MID outside the classroom was the Internet connection" " Learning styles are quite differences between inside and outside the classroom" "I hope I could update what I like into Dr.eye MID" "I am not frustrated with the new technology" The average time spent using Dr.eye MID was 95 minutes a day and seven days a week. Normally, they will use it when they are free.
Suggestions for Using Dr.eye MID	"In the mobile device learning industry, it should be designed and developed like smart-phones" "Learning materials should update faster" " I didn't need to worry about the device cost or the service fees" "Honestly, I am not comfortable using Dr.eye MID. I am used to practicing with paper-based quizzes" 8 students would spend the money to buy Dr.eye MID if they could get an extra discount. 10 students would recommend this device to classmates if they could get the free trial.

Results of Research Question 3: What are students' perspectives about learning English with a native speaker?
The questions regarding learning English with native speakers were used to understand students' feelings, motivation, and recommendations in this aspect. Most learners agreed that a native speaker provided a helpful learning environment for learning English. Overall, the suggestions represented students' positive attitudes

toward learning English with a native speaker. Table 12 below shows quotes from students regarding learning English with a native speaker.

Table 12: Participant Perspectives of Learning English with a Native Speaker

Native Instructor	"In this class, the instructor only speaks English. It really helps my listening a lot" "I like the instructor's accent" "It is a great opportunity to learn TOEIC listening with various teachers" "At the beginning, I was not used to speaking only English in class. After three classes with James, I really love his teaching style" "He can't explain grammar the Asian way" "He seldom pushed us to memorize the vocabulary" "His teaching style is just like when I was an exchange student at MIT" "He knows how to use easy words to explain hard words" "The instructor is patient, energetic, and energetic" "I think he has diverse teaching experience. He knows how to teach Asian students grammar exercises and vocabulary words" "The instructor frequently used the model questions in class" (10 students responded) "Normally, the instructor spent 15 minutes in class" (9 students responded regarding the average time spent using Dr.eye) " The instructor seldom used the daily words function in class" (6 students responded; 4 students said daily phrase)

CONCLUSIONS

This study shows how the integration of mobile devices and a native instructor in English learning can make students' learning more effective and interesting. Learners expressed the feeling that they were not learning alone when using mobile devices. Cultivating a partnership relationship helps learners to get networking experience. At the same time, providing multiple ways of learning English triggers students' learning motivation. Learners practice for TOEIC in their free time and thus learn time management skills on their own. Because functions in Dr. eye are in three languages, namely, Mandarin, English and Japanese, learners were naturally exposed to a diverse language learning environment. In addition, students mentioned learning with a native speaker really improved their listening and speaking skills, particularly listening skills. One of the students who scored 860 said his listening improved by more than 130 points during the three-month intensive training. He suggested that listening or speaking courses should be assigned to native teachers or at least to instructors use English only in class. Learning English with mobile devices and a native speaker had a significant positive improvement on students' performance. In addition, during the process of designing materials and activities, CRS offered regular teacher trainings to STs and LT once a month. It helped STs and LT to check their teaching process of TOEIC examination instruction, so they would not only focus on linguistic skills, but also business related knowledge. CRS shared the ideas when designing TOEIC classroom practices, drills and quizzes, hence skills that are business related such as writing a memo, response emails, meetings, discussions, express personnel opinions, gather and solving problems, making an official phone calls were emphasized in the worksheets. The result proved that this collaboration with CRS being effective in English learning These pragmatically combined factors, namely mobile devices and collaboration among subject teachers, one language teacher, and two industry managers, indicate that mobile devices with the appropriate cross-disciplinary cooperation did improve language learning and teaching. Outcomes showed that students not only increased the amount of interaction with teachers, but also practiced more often using an MID than paper-based assignments. If learners desire to learn English, using an MID will have a cumulative benefit for their future learning as well as for self-examination exercises and learning engagement.

Additional Findings

The TOEIC Learning Achievement Platform helped to record the practice times and attendance of students. Since students of this intensive course are from various colleges and departments, this simply showed a high demand of learning and improving English among students. Among them, one student improved his score from 650 to 850, an improvement of 200 points in only three months. This student majored in Applied English and was interviewed by the media, where he shared how he improved his language learning using MIDs. Hence, through the technology-assisted language learning, learning can be more practical and convenient.

DISCUSSIONS

Because of the positive results of this study, the President of Kainan University has announced that all College of Tourism and Hospitality students are required to join this TOEIC program. This includes students from Department of Logistics and Shipping Management, Department of Air Transportation, Department of

Transportation Technology and management, Department of Tourism and Hospitality, Department of Leisure and Recreation Management. The total student number would be 1050, with the freshmen divided into 14 classes and the sophomores divided into 16 classes—a total of 30 classes. The 30 classes will follow the model of this intensive course described in this study with the hope to replicate the possible result. Hopefully, a much larger quantity of data will provide more proof to the effectiveness of this teaching method.

REFERENCES

Chang,C.Y.,Sheu, J. P., & Chen, T.K. (2003). Concept and Design for Ad Hoc and Mobile Classrooms. *Journal of Computer Assisted Learning*, *19* (3), 336-346.

Chen, C.M., & Hsu, S.H. (2008). Personalized Intelligent Mobile Learning System for Supporting Effective English Learning. *Educational Technology & Society*, *11*(3),153-180.

Chen, J.J., & Yang, S.C. (2014). FOSTERING FOREIGN LANGUAGE LEARNING THROUGH TECHNOLOGY-ENHANCED INTERCULTURAL PROJECTS. *Language learning & Technology*, 18 (1), 57-75.

Demouy, V. & Kukulska-Hulme, A (2010). On the Spot: Using mobile devices for listening and speaking practices on a French language programme. *Open Learning, 25 (3)*, 217-232.

Dennen, V. P. & Hao, S. (2014). Intentionally mobile pedagogy: the M-COPE framework for mobile learning in higher education. *Technology, Pedagogy, and Education*, *23* (3), 397-419.

Dewey, J. (1916). Democracy and education. New York: Macmillan.

Dogoriti, E.,& Pange, J. (2012). Teaching ESP with ICT in Higher Education: Foreign Lamguage Teachers' Perspections and Expectations of Computer Technology Use in Foreign Language Learning and Teaching, ICICTE 2012 Proceedings, 24-34.

Education First (2013). 2013 EF English Proficiency Index. Retrieved on June 01, 2014 from: http://www.npf.org.tw/post/1/12933

Kuo, Y.C., & Wu, Z, Y. (2013). An online Peer-Tutoring Platform for programming Languages based on Learning Achievement and Teaching Skill. *International Journal of Information Technology & Computer Science*, 7(4), 65-70.

Kim, D., Ruechert, D., Kim, D.J., & Seo, D. (2013). STUDENTS' PERCEPTIONS AND EXPERIENCES OF MOBILE LEARNING. *Language Learning & Technology*, 17 (3), 52-73.

Kukulska-Hulme, A. (2009) Will mobile learning change language learning? *ReCALL*, 21(2), 157-165.

Law, N. Pelgrum, W.J. & Plomp, T. (Eds.). (2008). *Pedagogy and ICT use in schools around the world: Findings from the IEA SITES 2006 study*. Honk Kong: Comparative Education Research Centre.

Lim, C.P., Zhao, Y., Tondeur, J., Chai, C.S., & Tsai, C.C. (2013). Bridging the Gap: Technology Trends and Use of Technology in Schools. *Educational Technology & Society,* 16 (2), 59-68.

Mcconatha, D., Prual, M., & Lynch, M.J. (2008). MOBILE LEARNING IN HIGHER EDUCATION: AN EMPRICIAL ASSESSMENT OF A NEW EDUCATIONAL TOOL, *The Turkish Online Journal of Educational Technology*, 7 (3), 15-21.

Sandberg, J., Maris, M., & deomeus, K. (2011). Mobile English Learning: An evidence-based study with fifth graders. *Computers & Education*, 57, 1334-1347.

Stevens, T. (2010). Inventec's Dr. Eye puts Android in a pocket-sized laptop. Engadget. Retrieved from. http://www.engadget.com/2010/06/03/inventecs-dr-eye-puts-android-in-a-pocke t-sized-laptop/

Ting, Y.L. (2005). Mobile Learning: Current Trend and Future Challenges. Paper presented at the Fifth IEEE International Conference on Advanced Learning Technology, July 5-8, 2005, Kaohsiung, Taiwan.

Thornton, P. & Houser, C. (2005). Using mobile phones in English education in Japan, *Journal of Computer Assisted learning*, 21, 217-228.

William,M. & Burden, L. (1997). Psychology for language teachers: A social constructivist approach. Cambridge: Cambridge University Press.

Yakin, I.,Turkey, M., Tinmaz, H., & Turkey, I. (2013). USING TWITTER AS AN INSTRUCTIONAL TOOL: A CASE STUDY IN HIGHER EDUCATION, *The Turkish Online Journal of Educational Technology*, 12 (4), 209-218

Interactive Projector as an Interactive Teaching Tool in the Classroom: Evaluating Teaching Efficiency and Interactivity

Li-Ying Liu
National Changhua University of Education, Department of Biology

Meng-Tzu Cheng, Ph.D.
National Changhua University of Education, Department of Biology
No. 1, Jin-De Road, Changhua 500, Taiwan
mtcheng@cc.ncue.edu.tw

ABSTRACT
This study reports on a measurement that is used to investigate interactivity in the classrooms and examines the impact of integrating the interactive projector into middle school science classes on classroom interactivity and students' biology learning. A total of 126 7th grade Taiwanese students were involved in the study and quasi-experimental research with two-group posttest-only design was employed. Students in the experimental group were taught by using interactive projector (n=61) and their counterparts were taught by general data projector (n=65). The results show that there was no significant difference in students' learning achievement between teaching through interactive projector and general data projector. More interactions were observed in the experimental group; however, its perceived teaching efficiency was not better than teaching with a general data projector. It is suggested that the integration of interactive technologies in the classrooms might not ensure better learning performance or teaching efficiency, although various types of interactive actions were observed. The possible interpretations and suggestions for future studies are provided.

Keywords: interactive teaching; interactive projector; middle school science; classroom interactivity

INTRODUCTION
Nowadays, the interactive whiteboard (IWB) is regarded as a powerful educational technology which not only supports clear and seamless instruction but also raises the level of interactivity in classrooms (Mercer, Hennessy, & Warwick, 2010; Mildenhall, Marshall, & Swan, 2010). Many researches indicate that students are more involved and motivated while information and communications technology (ICT) is present (Beauchamp & Kennewell, 2010; Chaudary & Sharma, 2012; Serow & Callingham, 2011). But taking the price and ease of use into consideration, the interactive projectors, which are more flexible and low-cost, seem to be a better choice than IWBs for us. However, does integrating interactive projectors into biology classrooms truly bring more interactions? What is the impact of interactive projectors on classroom interactivity and student learning outcomes? As interactive projector is a new technology released recently, its actual teaching efficiency and effectiveness have not been empirically addressed so far. This study therefore focuses on investigating the impact of integrating interactive projectors into biology teaching from the aspect of classroom interactivity.

Traditional IWBs have large display devices connected with computers, and when disconnection occurs, the instruction is disrupted and students' attention is interrupted. Furthermore, in order to easily manipulate computers and display boards, instructors or students are often restricted to stand in front of IWBs or other interactive technologies to utilize it. By using the interactive projectors, instructors and students can remotely control all objects displayed from a distance, with no need to change classroom settings whilst enjoying the functionalities that IWBs or computers provide. Most researches point out that interactive technologies, such as interactive projectors and IWBs, play a crucial role in improving teacher-pupil interactivity. However, some studies indicate that teacher-centered teaching is unexpectedly strengthened, when the educational media, especially interactive technologies, are newly introduced into the classes (Kennewell, 2004; Hennessy, Mercer, & Warwick, 2011).

How to measure and clarify the interactivity in the classrooms is an important issue. As some researches point out, the reason why ICTs can support teaching activities depends mostly on their intrinsic and constructed features (Kennewell & Beauchamp, 2007), and once these features are perceived and transformed into external representations, they become actions. Hence, this study attempts to investigate these actions as indices of interactivity in the classrooms and further to examine the perceived effectiveness.

THE STUDY
Participants
In total, four classes of 7th grade (aged 12-13 years) Taiwanese students (n=126) were involved in this study.

Two classes were taught by using interactive projectors (interactive group, n=61) as instructional tool, and other two classes were taught by general data projector (general group, n=65).

Materials

This study employed the unit of digestive system as the instructional content due to its complexity. The teaching materials were mostly identical between interactive and general groups. Both groups adopted video clips to motivate pupils' learning. However, to attempt to utilize the functions that interactive projectors provide, some materials were modified to make it more actively operable.

Research Procedure

Both groups (interactive and general) received 2 lessons (90 minutes) by the same instructor. In order to exclude novelty effect resulted from using new technologies, instructors started teaching with either interactive or general data projector two weeks prior to conducting this study. A knowledge assessment was administrated to students as a posttest after the lessons. The lessons were recorded by camcorders for further analysis.

Instruments

Knowledge assessment

The development of knowledge assessment for digestive system included two phases. The original version of assessment was acquired from the previous study (Yen, 2011). A biological education expert, a biology teacher and a graduate student majoring in biology were invited to review and modify the items to ensure expert and face validity. A pre-trail test (n=146) was conducted and several ill-suited items were further excluded from the assessment according to the results of difficulty and discrimination analyses. At the end, a knowledge assessment consisting of 31 multiple-choice questions for measuring participants' understanding of digestive system was formulated (Cronbach's α=0.92).

Coding system for interactivity analysis

A coding system for analyzing classroom interactivity was developed to investigate the impact of integrating interactive projectors into science classrooms in this study. Previous studies which investigate classroom interactions always focus on reporting the contents and frequencies of dialogues of teachers and students (Mercer, Littleton, & Wegerif, 2004). The potential drawback of using this method is that it merely takes down the interactions between teachers and students. However, when the educational technology is integrated into a learning environment, there are at least three subjects interacting with: teacher, student, and the technology (in this case, interactive projector). We argue that only by recording actions perceived in the classroom, can we illustrate the whole picture of classroom interactivity. That's the reason why we developed a new coding scheme instead of using an existing one.

Some researchers have emphasized that only when the special features of interactive technologies are perceived and performed by both teachers and students, can its influence be revealed (Kennewell & Beauchamp, 2007; Beauchamp & Kennewell, 2013). Hence, we further defined "classroom interactivity" as "actions which are performed by teachers and students once they perceive the supported features of educational technologies and regard the features as a facilitator for initiating reciprocal dialogue, constructing learning environment and scaffolding knowledge, and these actions can be observed in the classrooms."

According to the previous research, there are 20 actions that ICTs can provide to construct instructional content and reveal potential efficiency (Kennewell & Beauchamp, 2007). Referring to the theoretical framework they put forth, we distributed these 20 actions into three categories depending on the role that interactive technologies can play in the classes (Beauchamp & Kennewell, 2010): *object*, *participant*, and *tool*. ICTs are considered as *objects* when it has a passive role to perfectly present people's commands, mainly to display pre-prepared materials. Namely, people interact *about* ICTs. ICTs are considered as *participants* when people interact *with* them. ICTs then serve as a learning environment and may be initiators of action and may pose unanticipated feedbacks to students' responses. When ICTs play a role of *tools*, people interact *through* them and are considered as a media which helps to achieve final learning goals and prompt deeper thinking processes (Warwick, Mercer, Kershner, & Staarman, 2010). Table 1 represents the developed coding system which describes the roles ICTs can play and the actions they can provide under each category.

Table 1: Roles that ICTs can play and possible actions they can provide.

Action	Description
Object: Interact about ICTs	
Selecting	A resource or procedure can be chosen from a list.
Comparing	Different features of an object or different objects can be compared.
Retrieving	Resources or saved files can be opened or accessed to.
Apprehending	Contents displayed can easily be watched and understood.
Transforming	Teaching materials can be showed in different information types or through different media.
Revisiting	The same materials or concepts can be emphasized by using repeated processes of activity in the same class.
Undoing	The status of entire process can be returned to the previous step or the very initiation.
Repeating	A saved or automatic process can be repeated.
Participant: Interact with ICTs	
Focusing	Particular aspect or specific process of presentations can be paid attention to.
Role playing	Some roles can be assumed in learning activities in fictional settings as in real lives.
Annotating	Notes can be added to a process or presentation.
Modeling	Relationships between variables can be showed to simulate process.
Responding	Complete actions can be prompted or demanded through ICTs.
Questioning	Questions that ask for answers can be showed through ICTs.
Prompting	Some short sentences or movements that trigger someone to do something can be showed by ICTs
Tool: Interact through ICTs	
Composing	Ideas can be organized and recorded once they arise.
Editing	Information stored and demonstrated can be easily modified without traces.
Collating	Different facilities can be integrated into single resource.
Sharing	Resources and ideas can be easily interchanged and communicated.
Cumulating	Different resources can be integrated into single presentation content

(continued)

Note. Modified from "The features of interactive whiteboard and their influence on learning" Kennewell & Beachamp (2007).

After the original version of the coding system has developed, one biological education expert and one graduate student who majors in biological education were invited to review and modify the definition of each category and the description of each interactive action. We met regularly to discuss whether the interactive actions belong to the classified category or the descriptions and definitions are clear enough and easy to be understood by coders until a common consensus was reached. The expert and facial validity were therefore ensured.

Data analysis

Classroom interactivity

Video recordings of classroom observations for both groups were edited for interactivity analysis and a one-minute video clip in 5 minute intervals were randomly created, generating 22 video clips for general group and 28 clips for interactive group. Two researchers (coders) participated in the coding procedure. Before coding, the developed coding system was clearly discussed and the definition of each action was carefully clarified by the two researchers. Then the coding task was conducted independently. Researchers recorded every different action they observed in the video clips and how many times the action happened, whilst also subjectively score the teaching efficiency brought by each action from 0 (no efficiency) to 4 points.

Two scores, *categorical* and *effective*, were calculated according to what actions were observed. For calculating *categorical score*, each action was given 1 to 3 points according to its category. Actions which show ICTs serving as *object* for directly responding to commands were scored 1 point each. If ICTs acted as *participants*, in that it is used not only for giving feedback to our manipulations but in initiating a discourse space for teachers and students, actions in this category were given 2 points each. Finally, when ICTs are used as a synergistic role to help teacher and students to construct knowledge, they act as *tools*. Actions in this category were given 3

points each. Categorical scores were generated by simply summing up the categorical points of observed actions. Teaching efficiency rated by researchers for each action was multiplied by the number of occurrences and then summed up, resulting in *effective score*.

Furthermore, researchers were additionally required to score the whole-class interactivity (from 1 to 10 points) for the sake of reciprocally verifying the reliability of the result. The final effective and categorical score and whole-class interactivity were obtained by respectively averaging scores between the two researchers.

Learning achievement

Students' responses to multiple-choice questions of the knowledge assessment were scored as correct or incorrect. They were given one point for each correct answer, which resulted in a maximal full score of 31 points. Analysis of covariance (ANCOVA) was run to examine if there was any difference in student performance on knowledge assessment between interactive and general groups. The obtained score of knowledge assessment was employed as independent variable and instructional treatment (interactive and general groups) was adopted as dependent variable. Students' performance in biology on the first midterm exam was used as the covariate.

FINDINGS

Interactivity

[Table 2] shows the coded actions. For general group, there were a total of 10 actions observed, with 9 of them coded by both researchers, whereas a total of 15 actions (and 12 of them were in common between researchers) were coded for interactive group. The result shows there were more actions observed in interactive group than general group for either all actions observed or actions coded in common by both researchers. [Table 3] represents categorical score, effective score and whole-class interactivity for both groups. The results reveal that effective score of general group (177.25) was better than interactive group (136.00); contrarily, categorical score of interactive group (70.25) was higher than general group (49.25). The scores of whole class interactivity were almost the same between the two groups (5.75 and 5.50, respectively).

Table 2: Actions observed by coders

	general group	interactive group
types of actions	selecting, comparing, apprehending, revisiting, focusing, responding, questioning, prompting, sharing, *transforming*	selecting, comparing, apprehending, undoing, focusing, annotating, responding, questioning, prompting, composing, editing, sharing, *retrieving*, *transforming*, *revisiting*
total actions observed	10	15

Note. Actions that were observed by both researchers were showed in normal and those observed by just one researcher were showed in italic.

Table 3: Effective score, categorical score and whole-class interactivity for both groups.

	effective score	categorical score	whole-class interactivity
general group	177.25	49.25	5.75
interactive group	136.00	70.25	5.50

Learning achievement

The results of ANCOVA for student performance on knowledge assessment were shown in [Table 4]. It is found that there is no significant difference in student knowledge acquisition between general group (Mean=19.20, SD=6.72) and interactive group (Mean=19.22, SD=7.28).

Table 4: The statistic results of ANCOVA for student performance on knowledge assessment.

component	sum of squares	df	mean square	F value
First midterm exam scores	2811.99	1	2811.99	104.42
Between	59.31	1	59.31	2.20
Within	3285.34	122	26.93	
Total	52582.00	126		

DISCUSSION

It was interesting to note that there was no significant difference in student achievement between teaching by interactive and general data projectors. However, Interactive group did have more classroom interactivity for all actions observed or actions coded in common, although the categorical score was higher for the interactive group. More interactive actions seem not appear to promise the perceived teaching efficiency as the effective score of interactive group was lower than general group. Namely, student learning outcomes and perceived teaching efficiency were not enhanced, although more interactive actions were observed in interactive group. The possible interpretations are as below.

Ceaseless interactive actions cause cognitive overload

According to the field notes of classroom observations made by researchers, the ceaseless interactive actions unexpectedly leaded students to become continually multi-tasking which frequently interrupts students' learning processes (Kirsh, 2000; Oliver, 1996). Instructor or students had to spend a lot of time interacting with the interactive projector, with some of these interactive actions being complex. This causes students to divert their attentions between the learning materials, instructors, peers and teaching media due to the use of interactive projector in the classrooms, resulting in extremely heavy cognitive load (Mayer & Moreno, 2003).

Recommendation

When an interactive technology is newly introduced into classes, pupils generally need a period of time to become accustomed (Clark, 1983). Hence the designed learning tasks should be appropriately scaffolded (Beauchamp, 2004), else students may spend too much time on writing and annotating rather than on learning.

In this study we developed a coding system for investigating classroom interactivity and primarily examined the effectiveness of the use of interactive projector on classroom interactivity and student learning outcomes. In future studies we would recommend that more research approaches, such as interviews and discourse analysis, could be conducted to further reveal the relationships between actions, interactivity, teaching efficiency and learning outcomes in the classroom.

ACKNOWLEDGEMENT

This research was funded by the National Science Council (NSC), Taiwan, under grant contract no. NSC 100-2511-S-018-014. All the supports are highly appreciated.

REFERENCES

Beauchamp, G. (2004). Teacher use of the interactive whiteboard in primary schools: towards an effective transition framework. *Technology, Pedagogy and Education, 13*(3), 327-348. doi: 10.1080/14759390400200186

Beauchamp, G., & Kennewell, S. (2010). Interactivity in the classroom and its impact on learning. *Computers & Education, 54*(3), 759-766. doi: http://dx.doi.org/10.1016/j.compedu.2009.09.033

Beauchamp, G., & Kennewell, S. (2013). Transition in pedagogical orchestration using the interactive whiteboard. *Education and Information Technologies, 18*, 179-191. doi: 10.1007/s10639-012-9230-z

Chaudhary, P., & Sharma, S. (2012). ICT in the 21st century classroom. *International Journal of Basic And Advanced Research, 1*(1), 1-5.

Clark, R. E. (1983). Reconsidering Research on Learning from Media. *REVIEW OF EDUCATIONAL RESEARCH, 53*(4), 445-459.

Hennessy, S., Mercer, N., & Warwick, P.(2011). A dialogic inquiry approach to working with teachers in developing classroom dialogue, *Teachers College Record, 113*(9), 1906-1959.

Kennewell, S. (2004). *Researching the Influence of Interactive Presentation Tools on Teacher Pedagogy*. Paper presented at the British Educational Research Association Annual Conference, Manchester, UK.

Kennewell, S., & Beauchamp, G. (2007). The features of interactive whiteboards and their influence on learning. *Learning, Media and Technology, 32*(3), 227-241. doi: 10.1080/17439880701511073

Kirsh, D. (2000). A few thoughts on cognitive overload. *Intellectica, 30*(1), 19-51.

Mayer, R. E. & Moreno, R. (2003). Nine Ways to Reduce Cognitive Load in Multimedia Learning. *EDUCATIONAL PSYCHLOGIST, 38*(1), 43-52.

Mercer, N., Hennessy, S., & Warwick, P.(2010). Using interactive whiteboards to orchestrate classroom dialogue, *Technology, Pedagogy and Education,19*(2), 1-15.

Mercer, N., Littleton, K., & Wegerif, R.(2004). Methods for studying the processes of interaction and collaborative activity in computer-based educational activities, *Technology, Pedagogy and Education,13*(2), 195-212.

Mildenhall, P., Marshall, L., & Swan, P.(2010). Interactive whiteboards: Interactive or just whiteboard?.*Australasian Journal of Educational Technology. 26*(4), 494-510.

Oliver, R. (1996). Interactions in Multimedia Learning Materials: The things that matter. In C. McBeathf & R. Atkinson (Eds.). *The Learning Superhighway: New World? New Worries? Proceedings of the Third International Interactive Multimedia Symposium*. Perth, Western Australia.

Serow, P. & Callingham, R. (2011). Levels of use of interactive whiteboard technology in the primary matehmatics classroom, Technology, *Pedagogy and Education.20*(2), 161-173.

Warwick, P., Mercer, N., Kershner, R., & Staarman, J. K. (2010). In the mind and in the technology: The vicarious presence of the teacher in pupil's learning of science in collaborative group activity at the interactive whiteboard. *Computers & Education, 55*(1), 350-362. doi: http://dx.doi.org/10.1016/j.compedu.2010.02.001

Yen, Y.-L. (2011). *The Effectiveness of Digital Games Instruction for Seventh Grade Students: Take An Example of "Digestive System"*. Master thesis, National Changhua University of Education, Changhua, Taiwan. Retrieved from http://ndltd.ncl.edu.tw/cgi-bin/gs32/gsweb.cgi/login?o=dnclcdr&s=id=%22099NCUE5112014%22.&searchmode=basic

Pre-Service Teachers' Learning Styles and Preferences towards Instructional Technology Activities and Collaborative Works

Farrah Dina Yusop
Department of Curriculum and Instructional Technology, Faculty of Education, University of Malaya
50603 Kuala Lumpur, MALAYSIA
For correspondence: farah@um.edu.my

Melati Sumari
Department of Educational Psychology and Counseling, Faculty of Education, University of Malaya
50603 Kuala Lumpur, MALAYSIA
melati@um.edu.my

ABSTRACT
The main purpose of this exploratory study was to investigate pre-service teachers' learning styles and their preferences with respect to 15 technology-based instructional activities and collaborative work tasks. Felder and Silverman's online Index of Learning Style (ILS) and a questionnaire were used to measure students' learning styles and preferences. Respondents were 53 third year pre-service teachers in the Early Childhood Education program and the Islamic Studies program at a Malaysian public university. Data analyses involved both descriptive and inferential statistics to further understand the learning style patterns of pre-service teachers. Findings revealed that pre-service teachers in this program tended to be reflective in the way they process information, sensitive in the way they perceive information, visual in the way they receive information, and sequential in the way they understand information. Although no significant correlation was found between students' learning styles and preferences towards collaborative and group work activities, interesting trends were observed in this study; active, intuitive, and global learners tended to dislike collaborative and group work activities when compared to reflective, sensing, and sequential learners. The findings of this study are important in assisting instructional technology instructors and higher education faculty in general in designing effective training programs for pre-service teachers particularly in relation to improve their technological skills.

INTRODUCTION
To date the Malaysian Ministry of Education has implemented a variety of technology-based programs in schools and higher-education institutions. Unfortunately current approaches to teaching and learning remain the same: heavy emphasis on rote learning and memorization techniques closely related to the exam-oriented educational system employed in the country (Author, 2014). This gap between what is intended to happen and what is currently happening in our educational system signifies the existence of a big gap deemed to require further scrutiny.

One of the reasons for this gap is the quality of teacher training at higher educational institutions. Despite various instructional technology courses having been incorporated into training programs, pre-service teachers (PST) are still unconfident and uncomfortable in integrating current technologies such as Web 2.0 and social media into their teaching practices (Chuang, Thompson, & Schmidt, 2003). Many factors have been considered as causing such problems, including lack of training facilities and limited time for exploring various technologies (Bingimlas, 2009; Jones, 2004), but mismatches between PST's learning and their teaching styles has received very little attention to date except several emerging research focusing on computer-based adaptive learning systems. Additionally, most research has been exploring the learning style profiles of PST but very few studies have been dedicated to investigating the relationship between students' learning styles and preferred teaching and learning strategies. Perhaps the closest research available is a study by Naimie, Siraj, Abuzaid, and Shagholi (2010) who suggested a *hypothesized* framework in which activities suit a specific learning style dimension. An empirical research in this area is still very limited.

This study thus intends to replicate previous studies on learning styles among PST, especially in Malaysia, by profiling their learning style dimensions based on Felder and Silverman's (1988) index of learning style (ILS). Most importantly, this study extends previous research by investigating the relationship between PST's learning style dimension with their demographic background such as gender and program of study, as well as their actual preferences towards certain technology-based instructional activities and collaborative works.

SIGNIFICANCE OF THE STUDY
Findings of this study are important in shedding some light into understanding suitable teaching approaches for pre-service teacher training programs in Malaysia and elsewhere. Additionally, findings on preferred

technology-based activities are helpful for assisting teacher education coordinators in including specific technology-based learning activities into their existing programs.

Research questions

This study is designed to answer the following questions:

- What are the general learning styles of Malaysian PST undertaking an instructional technology program? Are there multiple relationships between each of the learning styles?
- What is the relationship between learning styles and the students' gender, programs of study, and number of courses taken in the semester?
- What are the students' most and least preferred instructional technology activities?
- What is the relationship between learning styles and preferences towards collaborative work?

Learning styles

Knowledge of learning style is important in addressing the issues of individualized instruction and matching students' learning styles to teachers' teaching styles to maximize learning and enhance student performance (Felder & Brent, 2005; Ozgen, 2013). Review of learning-style literature has revealed that there are tendencies among researchers to discuss the issue of matching (or mismatching) teacher's and students' personalities and teaching methods (Smith & Renzulli, 1984) to enhance both teaching and learning. However teachers' lack of understanding of their learners' learning styles and even their own teaching styles often results in both parties inability to perform with excellence.

Taking an example from a compilation of research in engineering education, Felder & Brent (2005) reported that 63% of engineering students were found to be sensory learners, 82% were visual learners and 64% were active learners, while the typical instructional approach was "overwhelmingly verbal, emphasizing written explanations and mathematical formulations of physical phenomena over demonstrations and visual illustrations; and… rely almost exclusively on lectures and readings as the principal vehicles for transmitting information" (p.61-62).

This mismatch between learning and teaching style results in students becoming bored and inattentive with the lessons, "do poorly on tests, get discouraged about the courses, the curriculum, and themselves, and in some cases change to other curricula or drop out of school. (Felder & Spurlin, 2005, p. 2)".

Learning styles and demographic factors

Previous studies have examined several demographic factors contributing to preferred learning styles. These factors are closely related to how a person preferred to be taught such as needs for individualized instruction or collaborative group works and the types of learning activities they would like to exercise.

Matthews (1991) studied the differences between male and female students. He found that males preferred working with numbers and inanimate objects while females preferred language-based activities and were more likely to be people-oriented than males. Similarly female respondents in Jedin and Saad (2006) were found to be more collectivistic rather than individualistic, especially when working within a close circle of friends.

Academic program nature is another element influencing learning styles. It is common to assume that pure science students are more likely to be visual, kinesthetic, and … In contrast, social science students are assumed to more likely be auditory, verbal, and reflective students (Jedin & Saad, 2006). This observation could be related to the nature of the program of study itself. Pure science programs put emphasis on experimentation and discovery learning, while social sciences programs focus more on reflecting on current situations to make sense of what is happening in society in general.

However current research suggests that this may no longer be the case (Hamidah, Sarina, & Jusoff, 2009; Kumar, Voralu, Pani, & Sethuraman, 2009; Mohammed, Narayanasamy, Mutalib, Kaur, & Ariffin, 2011). This is because there is a possibility that the design of the academic programs themselves may influence the teaching strategies adopted by lecturers. Pure science, including programs like medicine and engineering, thus place emphasis on clinical and lab work compared to social science programs. Thus the course workload measured by the number of credit hours a student needs to register per semester for pure science programs may be fewer than for social science students. This is because social science students are required to register and enroll in as many courses as possible, sometimes across various social science disciplines, to better assist their understanding on the nature of the society; pure sciences students tend to be taught to focus only on very specific areas of study. Knowing the differences in the characteristics of the academic programs is thus crucial in assisting researchers to understand why students in certain programs prefer certain ways of learning.

The index of learning style (ILS)

ILS is a learning-style instrument based on Richard Felder's and Linda Silverman's (1988) model of learning style (Felder and Spurlin, 2005). The instrument consists of 44 questions with two options for answers. It identifies four categories or dimensions of learning: *Active* or *Reflective*, *Sensing* or *Intuitive*, *Visual* or *Verbal*, and *Sequential* or *Global*. The initial version, created by Richard Felder and Barbara Soloman in 1991, was tested with several hundred sets of responses. That version was revised through factor analysis methods with ineffective questions replaced with more suitable ones. The pencil-and-paper version of the instrument was later converted into a freely-available web-based instrument in 1997 (Felder and Spurlin, 2005) and was well-received by various learning institutions, both in the United States and internationally. The online version of the ILS instrument was reported to have been taken over 100,000 times annually and to have been used in a number of published studies (Litzinger, Lee & Wise, 2005).

The ILS instrument has the ability to include the various dimensions of learning style studied and developed by other researchers. For instance, the Active/Reflective dimension was coded from Kolb's Active/Reflective dimension, the MBTI's Extravert/Introvert dimension, and studies in the field of modality theory and neurolinguistic programming (Reid, 1987). However, it was more widely used to assess engineering students' and faculty's learning style preferences more than those of any other field, probably due to the fact that the developers of the instrument themselves came from the engineering field.

Active vs Reflective

The Active/Reflective dimension describes how students process information received. *Active* learners tend to *do* something with the information, such as discuss it, explain it, or test it in some way, while *reflective* learners are more likely to think and reflect on the information by examining and manipulating it introspectively (Felder and Silverman,1988). Thus, *reflective* learners may benefit a great deal from instructional activities that allow them to think and reflect on the information received, while *active* learners prefer instructional activities that provide an opportunity for actively experimenting with the information received. Also, *reflective* learners are more likely to work and learn better by themselves or with at most one other person compared to *active* learners who tend to work well in groups.

Sensing vs Intuitive

Developed based on Carl Jung's model of sensing and intuition learning, the Sensing vs Intuitive dimension explains the ways in which students perceive information, either externally or internally. *Sensor* learners tend to gather information externally, i.e., through their senses, including observations, while *intuitive* learners tend to perceive information internally, including speculation, imagination, and hunches (Felder and Silverman, 1988). Thus, *sensors* are more likely to prefer facts and data better over theories and principles, and to solve problems using standard methods, disliking uncertainty but exhibiting patience with details. Consequently, they may be slow but careful and good at memorizing facts. In contrast, *intuitors* prefer innovation and welcome complicated problems. They are quick but may perhaps be careless. They are also better at grasping new concepts when compared to *sensors*.

Visual vs Verbal

This dimension describes the way in which learners best receive information. *Visual* learners remember best what they *see*: pictures, diagrams, symbols, charts, demonstrations etc., while *verbal* learners remember best what they *hear*, e.g., when someone explains something to them such as when listening to lectures and engaging in discussion.

Sequential vs Global

This dimension deals with the way learners understand information. *Sequential* learners are more comfortable with materials presented logically ordered and in linear steps, while *global* learners tend to learn in large jumps. Felder and Silverman (1988) stated that *global* learners may find it easy to get lost in a wealth of information, but after some time may find that suddenly everything clicks and makes sense to them, even though they may have a hard time in explaining exactly how they arrived at their conclusions. *Sequential* learners are able to work with partially-presented materials, but *global* learners are more likely to search for the bigger picture to better understand the material. Thus, *sequential* learners benefit greatly from instructional activities presented sequentially, ranging from easy to more complex problems, while *global* learners may do better by jumping right into more complex and difficult problems. In addition, *sequential* learners are more likely to be convergent in their thinking and analysis. In contrast, *global* learners tend to be more divergent thinkers and synthesizers.

Given the four learning dimensions described in Felder-Silverman's Index of Learning Style (ILS), this study seeks to understand the learning styles of Malaysian PST in the "Instructional Media" course and to determine

relationships among elements of their demographic backgrounds, namely, students' gender, program of study and number of courses taken in a semester. Their preferences with respect to 15 types of active-based instructional technology activities and collaborative works were also investigated. It is hoped that findings from this study will provide a capability for helping teacher educators understand how Malaysian PST' in Instructional Technology programs perceive, receive, process, and understand information, and to use this knowledge to explore and experiment with various types of instructional technology and group work activities designed to support learning.

METHODOLOGY

Participants

Participants were 53 PST co-majoring in the Instructional Technology (IT) program in a Malaysian public university. The students were in their third year of study and enrolled in two academic programs: the Early Childhood Education program and the Islamic Studies program. All third year students from both programs (N=53) were invited to participate. All of them accepted and returned the completed questionnaire; the return rate was thus100%. Of that number, 75.5% (n=40) were females, reflecting the nature of the teaching profession in Malaysia with respect to gender. Although the participants had some exposure to computers and the Internet for personal use, the majority (n=30) stated a lack of confidence in utilizing technology for either teaching or learning purposes. Even though all participants were non-English speakers, they were considered to have at least an intermediate level of English proficiency. This is due to the fact that minimum requirement to enroll in both programs was a score within a range of 101 to 139, also known as Band 2 learners, in the Malaysian University English Test (MUET), an English language proficiency test used for the purpose of university admissions in Malaysia. Band 2 MUET scores mean that the learner was not a fluent communicator but did understand the language and its context when limited to certain situations (Malaysian Examinations Council, 2006).

Data collection

Data was collected through a combination of a combined structured (i.e. pre-defined options) and open-ended (i.e. subjective responses) questionnaire. The details of the questionnaire were as follows:

Section 1 – Demographic and Learning Style

This section describes information about the students' gender, age group, academic programs, and learning style. The learning style was measured using the Index of Learning Style (ILS) instrument. Students were required to take the online Index of Learning Style (ILS) instrument developed by Dr. Richard M Felder and Barbara A. Soloman of North Carolina State University (available at no cost at http://www.engr.ncsu.edu/learningstyles/ilsweb.html) to determine their individually-preferred learning styles. There were 44 questions to be answered with one of two options. Once the test was completed, student responses were analyzed by the system and analysis of their learning style was returned in the form of numbers, each indicating the degree of learning style. For example, a student who received the results "7/4" for Active/Reflective means that the student is a moderately Active learner in contrast to being a Reflective learner. The total for each number pair must be 11, since there are 11 questions in the test for each of the four learning-style dimensions, i.e., Active/Reflective, Sensing/Intuitive, Visual/Verbal, and Sequential/Global.

The decision to use ILS over other instruments was based on the fact that it was both free and accessible online, making it convenient for both the instructor and the students to access at any time. Also, the ILS instrument was developed using a combination of various developers' research and included justifications (and modifications) made from other learning-style instruments, e.g., the Myers-Bringgs Type Indicator (MBTI) and Kolb's model of learning. This made this choice, from the perspective of the instructor, a comprehensive yet simplified version of various learning-style instruments. Moreover, the ILS instrument contained only 44 questions that could be completed within as little as 15-20 minutes, compared to other instruments that might take longer times for completion and thereby distract students from giving honest answers.

Section 2 – Instructional technology activities

This section contains questions related to students' preference towards 15 instructional technology activities on a scale of 1 to 15, where 1 indicates the most enjoyable learning experience and 15 the least enjoyable learning experience. A space was provided next to each of the activities to enable students to more completely express their thoughts about these activities.

Section 3 – Learning resources

This section contains questions related to students' preferences towards the learning resources used in the course. Answers were to be given in the form "Yes/No".

Section 4 – Feedback on group work
Answers to questions in this section were in the form of "Yes/No" and were related to evaluating the effectiveness of the course from a student perspective. The section included preferences toward working in groups and collaborative type of work in general.

Data analysis
Data gathered from the questionnaire were coded and analyzed using the SPSS (**S**tatistical **P**ackage for the **S**ocial **S**ciences) software. Analyses used include descriptive statistics to describe the data and Pearson correlation coefficients to discern the relationships between learning styles and each of the variables investigated.

RESULTS AND DISCUSSION
This section will present the results of the analyses conducted in answering each of the research questions. Analyses were also conducted to support these results.

The pre-service teachers' (PST) learning styles
Initially, scores for each learning style were entered exactly as indicated by the students themselves. For instance, if a student scored "7/4" for Active/Reflective learning dimension, the score will be entered as "7" for the "Active" variable, and "4" for the "Reflective" variable. The scores a student received in each dimension must not exceed 11 (the maximum score) nor be less than 0 (the minimum score), and the total of the scores in each dimension must be 11, since each of the styles are paired together to constitute a dimension.

The scores were then re-coded using the 're-code' feature in SPSS, following the Felder and Spurlin (2005) suggestions for categorization of learning-style dimensions. As a result, 3 categories of strength of learning style (strong, moderate, and mild) were created corresponding to the range of the learning-style scores, as indicated in Table 1.

---Insert Table1 at about here ---
Caption: Categorization of the learning style into strong, moderate and mild

The first component of each pair of the learning-style dimensions is referred to as the 'a' item and the second component is referred to as the 'b' item. For example, scores of 10 and 11 were categorized as 'strong 'a' learners, and so on.

A frequency distribution of students' learning styles based on strengths of the learning style preferences: *strong, moderate* and *mild* is presented in Table 2.

---Insert Table 2 at about here ---
Caption: Frequency distribution of the learning styles based on the strengths: Strong, Moderate and Mild

The results showed that the dominant learning styles in each dimension were mild reflective (45.5%), mild sensing (32.6%), moderate verbal (30.2%), and mild sequential (37.2%). These learning styles were found to be similar to those found for other technically-oriented programs. A study on engineering students' learning styles (Litzinger *et al.*, 2005; Zywno, 2003) revealed sequential, sensing, and visual styles. The only difference was that engineering students in those studies were identified as active learners while the PSTs in this study were found to be more in the nature of reflective learners. This difference is perhaps due to the differing natures of the two fields; students in science-based programs such as engineering are more often exposed to active and hands-on learning activities than those in social science programs like education.

Interestingly, comparison among the four learning dimensions revealed that the most dominant learning-style dimension is the Visual-Verbal dimension. 41.9% students are identified as strong Visual-Verbal learners in contrast to strong Active/Reflective (2.3%), strong Sensing/Intuitive (7%), and strong Sequential/Global (2.3%) learners. This result is consistent with past studies demonstrating that typical education and liberal arts students are Visual-Verbal learners (Litzinger *et al.*, 2005).

Relationship between each of the learning style
Analysis of Pearson correlation coefficients between each of the learning styles was also conducted to analyze the relationships among them, as presented in Table 3.

---Insert Table 3 at about here ---

Caption: Correlation coefficient between each of the learning style

The Pearson correlation coefficient results in Table 3 above revealed some interesting findings:

1. It was confirmed that all of the original 'a' and 'b' pairs suggested by Felder-Soloman (1991) are true, except for Visual-Verbal dimensions, for the PSTs in this study.
2. It also suggests the following interconnections between learning style preferences:
    a) active learners tend to be visual
    b) sensor learners tend to be sequential and not likely to be global or intuitive
    c) visual learners tend to be active and sequential and not likely to be reflective and global
    d) sequential learners tend to be sensing and visual and not likely to be intuitive
    e) global learners tend to be intuitive and not likely to be sensing or visual

a) Comparison between the findings and the original learning style pairings
In detail, all of the original pairs of learning styles, except for the Visual and Verbal learning style, revealed statistically-significant moderate to very high negative relationships,. It was found that there is a significantly high negative relationship between Active and Reflective (-0.877) at the 0.001 level, a significantly moderate negative relationship between Sensing and Intuitive (-0.559) at the 0.001 level, and a significantly very high negative relationship between Sequential and Global learning styles (-0.877) at the 0.001 level. These results imply that the pairings suggested by Felder and Soloman (1991) were true for the respondents in this study. In other words, the three learning dimensions of Active/Reflective, Sensing/Intuitive, and Sequential/Global were confirmed by this study. However, there was no significant correlation, either negative or positive, between the Visual and Verbal learning styles.

b) Interconnections between the learning style preferences
Findings also suggested that there is a low tendency for active learners to be visual (r= 0.372 at 0.05 level). This suggests that students who receive information best through visual representations (visual) are more comfortable in experimenting with data (active).

Another finding revealed that sensor learners tend to be sequential (r= 0.491 at the 0.01 level), not likely to be global (r= -0.484 at the 0.01 level) or intuitive (r= -0.559 at the 0.01 level). This means that students who learn best through their senses (sensing) tend to understand better if the information is presented sequentially (sequential).

It was also found that visual learners tend to be active (r= 0.372 at the 0.05 level) and sequential (r= 0.406 at the 0.01 level), but not likely to be reflective (r= -0.319 at the 0.05 level) or global (r= -0.356 at the 0.05 level). In other words, it is is suggested that students who receive information best through visual representations (visual) are not likely to thoughtfully reflect on it (reflect); instead they are more comfortable in experimenting with it (active). Similarly, visual learners may not be comfortable to learn in large jumps (global); they learn best when they are able to see interconnections between the new information and previously-obtained information (sequential).

In addition, sequential learners tend to be sensing (r= 0.491 at the 0.01 level) and visual (r= 0.406 at the 0.01 level), but not likely to be intuitive (r= -0.319 at the 0.05 level). This implies that students who understand better when information is presented logically in sequential order (sequential) are more comfortable working and learning with facts, data, principles, standards (sensing), and visual representations (visual) rather than concepts, theories, and uncertainties (intuitive).

Finally, global learners tend to be intuitive (r= -0.316 at the 0.05 level), but not likely to be sensing (r= -0.484 at the 0.01 level) or visual (r= -0.356 at the 0.05 level), implying that global learners able to learn in large jumps are more likely to explore uncertainties and possibilities when solving problems and may be bored with facts (sensing) and visuals (visual).

To summarize, these findings are different, except for the Sensing and Visual relationship, from those of another study conducted by Zywno (2003) with engineering students as the sample. In his study, Zywno found that there was a very low positive relationship between Sensing and Active (0.176) and Sensing and Sequential (0.323). Interestingly, he found a significantly very low negative relationship between the Sequential and Visual styles among engineering learners (-0.086 at the 0.05 level), while in this study involving PST, it was found that the relationship between Sequential and Visual learning styles is significantly low positive (0.406) at the 0.01 level. This means that PST students co-majoring in Instructional Technology programs who are Sequential learners

tend to also be Visual learners compared to Sequential Engineering learners who are unlikely to be Visual learners.

Relationship between learning style and the demographic background

Analysis of Pearson correlation coefficients between learning styles with respect to gender, program of study (i.e., Early Childhood and Islamic Education), ethnicity, and course workload measured by the number of courses taken in a semester revealed that there is no significant differences among the variables. In other words, the students' gender, program of study, ethnicity and course workload measured by number of courses taken in the semester are not significantly related to their learning-style preferences.

Preferences towards 15 instructional technology activities

The students were asked to rank their preferred instructional technology activities on a 15-point scale, with 1 being the most enjoyable activity and 15 the least enjoyable activity. The means and standard deviations for the 15 items of these instructional activities are presented in Table 4. The smallest mean value indicates the most preferable activity while the mean value, closest to 15 indicates the least preferable activity.

---Insert Table 4 at about here ---

Caption: Means and standard deviations for preferred instructional activities. (Note: 1 = Most enjoyable and 15 = Least enjoyable)

Table 4 indicates that the most preferred activity is the first, production of short video clips using a variety of multimedia equipment and software (mean = 4.07), followed by the third, the live, in-class debate on an instructional technology-related topic (mean = 4.58), and the second, the presentation of short video clips (mean = 6.49). It was also found that activity 7, student-led presentation on the topic history of media in instruction, is the least preferable activity (mean = 10.87), followed by activity 6, analysis of a short video via e-Group (mean = 9.84), and activity 14, student-led training in the use of presentational software (PowerPoint) for tutorial purposes (mean = 9.51).

These findings reflect the students' preferences towards instructional activities that deal with *doing* something related to visual representations as well as toward verbal-related activities such as presentation, discussion, and reflection. These preferences may exist because a majority (41.9%) of the students exhibited a strong Visual-Verbal learning style. The results also showed that the students least preferred activities that deal with history, i.e., details and facts, even though they were assessed to be Sensor learners.

The relationship between learning styles and preference for being involved in group-oriented work activities

Table 5 presents the means and standard deviations of the learning styles with respect to two questions related to group-oriented work preferences among the respondents. The answers are dichotomous, either "Yes" or "No", so a mean below 1.5 reflects "Yes" answers and vice versa.

---Insert Table 5 at about here ---

Caption: Means and standard deviations of learning styles and preferences towards group work activities

The results in Table 5 revealed that students prefer collaborative and group-oriented work activities. Their preferences towards such activities are shown by the relatively small values of the means, i.e., 1.0377 and 1.0755.

A Pearson correlation coefficient analysis between learning styles and group-oriented work preferences was also conducted to test relationships among the variables. The results are presented in Table 6.

---Insert Table 6 at about here ---

Caption: Pearson correlation coefficient analysis between learning style and preferences towards group work activities

The results shown in Table 6 reveal that, while there is no statistically significant correlation between students' learning styles and their preference towards group-oriented work activities, there are still some interesting connections between learning styles and preferences towards such activities.

The statistically insignificant results indicate that Reflective, Sensing, Verbal, and Sequential learners, representing the identified learning styles of the students in the study, prefer collaborative and group-oriented work activities more than do Active, Intuitive, and Global learners. These results are supported by the large percentage (94.34%) of responses that indicated preferences towards collaborative and group work activities.

These findings, even though statistically insignificant, differ from the Felder-Silverman suggestion that Reflective learners learn best by themselves and therefore show tendencies towards working alone or at most with one other person (Felder & Silverman, 1988) unlike Active learners who are said to work well in groups. Data in this study shows that Reflective learners along with Sensing, Verbal, and Sequential learners seemed to prefer collaborative and group work activities.

CONCLUSIONS

The results indicate that Malaysian PST co-majoring in the Instructional Technology program tend to be reflective, sensing, verbal, and sequential. In other words, the PST are more likely to think and reflect (reflective) on rather than to do something about the information they acquired externally (sensor) and in sequential (sequential) order. This finding supports the common perception of the characteristics of typical social sciences students as being reflective and sequential in nature.

The most obvious and dominant learning style dimension is the Visual-Verbal learning dimension suggesting that students learn best when they are given the opportunity to interact with a variety of visual representations (visual) as well as the opportunity to explain and share their thinking to others (verbal). This finding is not uncommon among PST whose profession involves verbal communication when interacting with their students. The visual aspect of their learning styles also aligned with their tendencies to create instructional materials to help with their teaching practices.

What is particularly interesting is their preference toward being sensor learners. It suggests that the PST in this study actually value the opportunity to use and manipulate multimedia equipment to produce creative media products such as video clips, the most preferred type of instructional technology activity, for instructional purposes,. However, this need for sensory learning is not necessarily exhibited in current instructional methods used by teacher educators in many teacher education training programs. Except for a few courses, such as micro-teaching and those relating to instructional methods for teaching specific subject areas, the most common instructional strategies used are combination of lectures and small group discussions.

Findings in this study suggest that teacher educators should revamp their instructional strategies to include more sensory-based activities for PST. In the context of technology-based courses, this will mean more activities involving students' manipulating and experiencing a variety of multimedia technologies such as video editing, courseware development, and modification through social media such as Facebook, Twitter, and wiki, for teaching and learning purposes. These teaching and learning activities will allow PST achieve a better understanding of how technologies can be manipulated to support their future teaching. Additionally these are the skills that are required from PST as indicated in the ISTE (International Society for Technology in Education) National Educational Technology Standards (NETS) of teaching with technology (ISTE, 2014).

Findings in this study are significant in explaining PST's preferences with respect to a variety of learning styles and instructional activities. It is important for PST to be aware of their own learning style preferences, both in terms of their strengths and weaknesses, so that they will be aware of the diversity of learning-style preferences among their future students in the classroom. For teacher-educators, the findings imply that there is a need to expose PST to various instructional activities that support a variety of learning styles and group-oriented work. As Smith & Renzulli (1984) stated, information about students' learning styles should not be limited to only matching teaching styles with learning styles, but should also create a balance or mismatch between them so that students are given opportunities to try out other learning styles about which they may be unaware.

ACKNOWLEDGEMENTS

This study is supported by the University of Malaya Research (grant no. RP004E-13ICT) and Research University Grant (no. RU022C-2014).

REFERENCES

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

Chuang, H.-H., Thompson, A., & Schmidt, D. (2003). Faculty technology mentoring programs: major trends in the literature. *Journal of Computing in Teacher education, 19*(4), 101-106.

Dunn, R. S. (1983). Learning style and its relation to exceptionality at both ends of the spectrum. *Exceptional Children, 49*, 496-506.

Dunn, R. S., Dunn, K. J., & Price, G. E. (1979). *The productivity environmental preference survey*. Lawrence, KS: Price Systems.

Felder, R. M., & Brent, R. (2005). Understanding student differences. *Journal of Engineering Education, 94*(1), 57-72.

Felder, R. M., & Spurlin, J. (2005). Applications, reliability and validity of the Index of Learning Styles. *International Journal of Engineering Education, 21*(1), 103-112.

Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering Education, 78*(7), 674-681.

Hamidah, J. S., Sarina, M. N., & Jusoff, K. (2009). The social interaction learning styles of science and social science students. *Asian Social Science, 5*(7).

ISTE. (2014). National educational technology standards (NETS). Retrieved January, 2014, from http://www.iste.org/docs/pdfs/20-14_ISTE_Standards-S_PDF.pdf

Jedin, M., & Saad, N. (2006). *A preliminary study on gender and learning style in Malaysian higher learning institutions: evidence from a cultural perspective.* Paper presented at the Critical Visions, Proceedings of the 29th HERDSA Annual Conference, Western Australia.

Jones, A. (2004). *A review of the research literature on barriers to the uptake of ICT by teachers*. UK: British Educational Technology Agency (Becta).

Kumar, L. R., Voralu, K., Pani, S., & Sethuraman, K. (2009). Predominant learning styles adopted by AIMST University students in Malaysia. *South-East Asian Journal of Medical Education, 3*(1), 37-46.

Jonassen, D.H. (1996). *Computers in the classroom: Mindtools for critical thinking.* Columbus, OH: Merrill/Prentice-Hall.

Litzinger, T. A., Lee, S. H., & Wise, J. C. (2005). A study of the reliability and validity of the Felder-Soloman Index of Learning Styles. *Education, 113*, 77.

Malaysian Examinations Council (2006). Malaysian University English Test (MUET): regulations, test specifications, test format and sample questions. Retrieved January, 2013, from http://www.google.com.my/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB4QFjAA&url=http%3A%2F%2Fwww.mpm.edu.my%2Fdocuments%2F10156%2Fc5c332ab-3d97-4959-83c0-09866eea0774&ei=mLr5U9LEFNC-uASEzoCQBw&usg=AFQjCNFw5H0WLEccr_zByVElihjCTjMD1A&sig2=O3yveKqmIQWqdNoH4rv7Ew&bvm=bv.73612305,d.c2E

Matthews, D. B. (1991). Learning styles research: Implications for increasing students in teacher education programs. *Journal Of Instructional Psychology, 18* (4).

Mohammed, Z., Narayanasamy, S., Mutalib, H. A., Kaur, S., & Ariffin, S. R. (2011). Learning styles preferences among third year optometry students of Universiti Kebangsaan Malaysia. *Procedia-Social and Behavioral Sciences, 18*, 384-387.

Naimie, Z., Siraj, S., Abuzaid, R. A., & Shagholi, R. (2010). Hypothesized learners' technology preferences based on learning style dimensions. *Turkish Online Journal of Educational Technology, 9*(4), 83-93.

Ozgen, K. (2013). An analysis of high school students' mathematical literacy self-efficacy beliefs in relation to their learning styles. *The Asia-Pacific Education Researcher, 22*(1), 91-100. doi: 10.1007/s40299-012-0030-4

Reid, J. M. (1987). The learning style preferences of ESL students. *TESOL Quarterly, 21*(1), 87-111. Field independent cognitive styles and their educational implications. *Review of Educational Research, 47*, 1-64.

Smith, L. H., & Renzulli, J. S. (1984). Learning style preferences: a practical approach for classroom teachers. *Theory into Practice, 23*(1), 44-50.

Witkin, H. A., Moore, C. A., Oltman, P., Goodenough, D. R., Friedman, F., & Owen, D. R. (1977b). Role of field dependent and field independent cognitive styles in academic evolution. *Journal of Educational Psychology, 69*, 197-211.

Author. (2014). Social media for social advances: Use of social media in educating future generations. In Ainin Sulaiman and M. Muzamil Naqshbandi, *Social dynamism, issues and challenges*. USA: Patridge Publishing.

Zywno, M. S. (2003). *A contribution to validation of score meaning for Felder-Soloman's Index of Learning Styles.* Paper presented at the American Society for Engineering Education Annual Conference & Exposition.

List of tables and captions

TABLE 1
Categorization of the learning style into strong, moderate and mild

The 'a' items	The 'b' items	Categorization
Active	Reflective	• strong 'a' - 'a' score between 10 or 11
Sensing	Intuitive	• moderate 'a' - 'a' score between 8 or 9
Visual	Verbal	• mild 'a' - 'a' score between 6 or 7
Sequential	Global	• mild 'b'- 'a' score between 4 or 5
		• moderate 'b' - 'a' score between 3 or 2
		• strong 'b' - 'a' score between 0 or 1

TABLE 2
Frequency distribution of the learning styles based on the strengths: Strong, Moderate and Mild

	Active/Reflective (%)		Sensing/Intuitive (%)		Visual/Verbal (%)		Sequential/Global (%)	
	Act	Ref	Sen	Int	Vis	Veb	Seq	Glo
Strong (10 or 11)	0	2.3	4.7	2.3	16.3	25.6	0	2.3
Moderate (8 or9)	4.5	25	18.6	18.6	2.3	**30.2**	18.6	7
Mild (6 or 7)	22.7	**45.5**	**32.6**	23.3	9.3	16.3	**37.2**	34.9

TABLE 3
Correlation coefficient between each of the learning style

	Active (a)	Reflective (b)	Sensing (a)	Intuitive (b)	Visual (a)	Verbal (b)	Sequential (a)	Global (b)
Active (a)	1	-.877**	0.049	0.061	**.372(*)**	-0.269	0.045	-0.005
Reflective (b)	-.877**	1	-0.040	-0.067	-.319(*)	0.250	-0.028	0.017
Sensing (a)	0.049	-0.040	1	-.559**	0.249	0.254	**.491****	-.484**
Intuitive (b)	0.061	-0.067	-.559**)	1	-0.114	-0.112	-.319*	**.316***
Visual (a)	**.372(*)**	-.319*	0.249	-0.114	1	-0.105	**.406****	-.356(*)
Verbal (b)	-0.269	0.250	0.254	-0.112	-0.105	1	0.252	-0.275
Sequential (a)	0.045	-0.028	**.491(**)**	-.319(*)	**.406(**)**	0.252	1	-.988**
Global (b)	-0.005	0.017	-.484**	.316*	-.356(*)	-0.275	-.988**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

TABLE 4
Means and standard deviations for preferred instructional activities. (Note: 1 = Most enjoyable and 15 = Least enjoyable)

Instructional activities	n	Mean	SD
1. Produce short video clips using multimedia equipment i.e. digital camera, digital video recorder, interactive whiteboard etc.	45	**4.07**	3.63
2. Present short video clips to whole class and receive feedback from peers and instructor	45	**6.49**	4.42
3. Live, in-class debate among groups on a instructional technology related topic	45	**4.58**	4.47
4. Discuss the use of traditional children's songs to deliver instructional content and motivate students to learn via e-Group	45	8.38	4.17
5. Discuss the multimedia technique used in a picture via e-Group	45	7.69	4.24
6. Analyze a short video posted in the web via e-Group	44	**9.84**	4.32
7. Student-led presentation on the history of media in education – creative use of blackboard and interactive whiteboard to bring in the history	45	**10.87**	4.07
8. Student-led presentation on application of behaviorism in media design – application of design principals and techniques	45	7.60	3.45
9. Student-led presentation on application of cognitivism in media design – the use online games to solve problems and motivate learning	45	6.87	3.82
10. Student-led presentation on application of constructivism in media design – direct presentation of the content	45	7.71	3.98
11. Student-led presentation on the social-psychological perspective in media design -	45	9.31	3.83
12. Student-led training on the integration of word processor in instruction – application of software to enhance data management	45	7.87	3.34

TABLE 5
Means and standard deviations of learning styles and preferences towards group work activities

Learning Style	Mean	Std. Deviation
Active Learning Style	5.41	1.62
Reflective learning style	7.75	1.63
Sensing learning style	6.19	2.40
Intuitive learning style	6.32	2.37
Visual learning style	3.44	2.13
Verbal learning style	8.05	3.38
Sequential learning style	6.81	1.97
Global learning style	6.23	1.96
Do student appreciate collaborative learning	1.04	0.19
Do students learn better in groups	1.07	2.67

TABLE 6
Pearson correlation coefficient analysis between learning style and preferences towards group work activities

	Preference towards collaborative	Preference of learning in groups
Active	-0.192	-0.238
Reflective	0.169	0.210
Sensing	0.169	0.286
Intuitive	-0.125	-0.233
Visual	-0.046	0.029
Verbal	0.129	0.105
Sequential	0.248	0.120
Global	-0.254	-0.127

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Prospective Teachers' Likelihood of Performing Unethical Behaviors in the Real and Virtual Environments

Ömür Akdemir
Bülent Ecevit University Zonguldak/TURKEY
Corresponding Author: omurakdemir@gmail.com

Ömer F. Vural
Gaziantep University
ofarukvural@yahoo.com

Özgür M. Çolakoğlu
Bülent Ecevit University
ozgurmat@hotmail.com

ABSTRACT
Individuals act different in virtual environment than real life. The primary purpose of this study is to investigate the prospective teachers' likelihood of performing unethical behaviors in the real and virtual environments. Prospective teachers are surveyed online and their perceptions have been collected for various scenarios. Findings revealed that prospective teachers are more likely to perform unethical behaviors in virtual environment than real life. Results also revealed that men and more internet users regardless of their gender are more likely to perform unethical behaviors in virtual environment than women and less internet users. Future research should investigate the driving forces to perform unethical behaviors in virtual environment.

Keywords: cyberbullying; virtual environment; teacher education, ethics

INTRODUCTION
The amount of information produced by society and dependence on information in daily work is increased every day. Therefore, the society we live in have become increasingly dependent on computers and other communication technologies (Wong, 1995; Ng, 2008). The contemporary world has witnessed the development of information technologies (Ince & Akdemir, 2013). The effects of the information technologies are observed in different settings (Akdemir, 2008). Stichler and Hauptman (1998) stated that the use of new communication technologies in the life affects individuals' beliefs and actions. The new communication technologies brought new ethic problems (Moor, 2004; Mullen & Horner, 2004). Technological developments expose new attitudes towards new situations (Masrom et al., 2008). Moreover, it is not known exactly how these communication technologies influence society's beliefs and actions. Kabakçı and Odabaşı (2003) claimed that these changes in the society have led to the emergence of new beliefs and values. These means for communication have led to changes of people relationship between each other and their leisure time activities. It caused the emergence of many new negative habits and behaviors (Ahmed, 2002). Mason (1996) defined four ethical problems of information era as intellectual property, privacy, access and truth. Intellectual property, all kind of products produced by human brains, is required personal permission before using it. Individuals do not see as a problem to use any digital knowledge or product without getting permission (Uysal & Şendağ, 2006). However, individuals usually get permission to use physical materials belonging to others in their daily life. As a privacy problem, new technologies make it possible to reach the personal private information (Mason, 1986). Quinn (2005) mentioned that though these new technologies have many benefits for people, new technologies can be used for personal gain by abusing others. In this way, personal information of individual can be accessed or disclosed this information without permission of the owners. Access is a problem by providing individuals' information reached from computer or internet environment. This is related to intellectual property problem. Moreover, truth is a problem about whether the information reached is trustworthy or not (Uysal & Şendağ, 2006). Willard (2001) claimed that virtual environment provides less emotional feedback than normal environment so the virtual environment causes persons to remain insensitive to various events or conditions. In addition, the possible effects of the actions done in the virtual environment often are not considered thoroughly. Probably the primary reason is the belief that there is a lack of control that may penalize responsible ones in the virtual environment. Stewart (2000) stated the cause of various crimes committed in e-environment that a person who performs the action with technology and not performed face-to-face perceives this as a game, intellectual challenge or race.

In general, the decision-making process of physical action is affected negatively while someone does not approve it. However, if this action is being performed on the virtual environment using technology and low

probability to be observed by someone else, the views of someone on the actions affect the decision making process much less (Woodbury, 2003). The result of the study reveal that 95% of people are against stealing the software in the CD, DVD or similar tools, while one-third of these people do not oppose to be downloaded the same software from the internet illegally (Business Software Alliance, 2004). Likewise, more than half of internet users do not think to download music from the internet on their computers as a theft. Callahan (2004) stated that people usually refer to this way since the penalty of unethical economic benefits is less. According to investigation results, after Recording Industry Association in USA started to sue for illegal downloading and copying, illegal download rates have decreased over the internet (Poole, 2007). People have begun to review their actions on virtual environment again and again since the legal regulations were legislated (Madden & Rainie, 2005).

Theoretical Base

The American Heritage Dictionary defines the term "ethics" as "The rules or standards governing the conduct of a person or the conduct of the members of a profession." Fieser (2006) mentioned that the ethics' studies are related to a philosophical of morality involving to make a decision in regard to concepts of right and wrong behavior. There are some underlying principles of ethical actions that are; a person does not harm and deceive to others; the person should acknowledge a person's right to life, privacy, safety and a person's freedom of choice over his or her actions (Ng, 2008). Moral is related about how people perceive and evaluate good and evil, right and wrong, norms and values accepted by the person's social system (Haidt, 2006; Hauser, 2006; De Waal, 1996; Turiel, 1983a, 1983b). Ethics and morals are both related to "right" and "wrong" action, and are mostly used interchangeably. However, they are different. Ethics refer to rules that are provided by an external source such as, authorities, religion principles, or codes of workplaces. On the other hand; morals refer to an individual's own principles regarding to what is right and wrong. There are several theories related to individual's moral values and how individual decides to do things. Academician and theorists discussed on many strategies related to how people decide to do things. These decision-making strategies vary based on work responsibilities (Bresford & Sloper, 2008). While some theories try to explain behavior of individuals within organization as members, others mentioned in this study explain the underlying causes of individuals' behavior.

The rational model is a rational and completely informed decision-making process, consists of several steps (Turpin & Marais, 2004) which are intelligence, design, choice, and review (Simon, 1997). When someone uses this model to make a decision, the model assumes that one knows all possible alternatives, the consequences of alternatives, the set of choices for the consequences, and one has the computational ability to compare the consequences to determine which is preferred (Kreitner & Kinicki, 2001).

The primary purpose of naturalistic decision-making is to examine and understand decision-making in the natural context (Turpin & Marais, 2004). According to Klein studies (1998), decision-maker's ability recognizes a situation from the similar situation defined in line with previous experiences. The previous similar situation gives important clues associated with such a situation and the appropriate target returns associated with expectations. In this direction the decision-makers know behavior of which will lead to succeed. The course of action is evaluated by visualizing expected behavior through a mental simulation. The decision-maker revises fictionalized behavior until feeling comfortable with it, then the course of action is implemented. All of that happens within a very short period. According to this model, the experience is the most important factor to make the right decision.

There are several theories explaining how someone makes decisions (Poole, 2007). The ethics studies collected the decision-making models under the three models which are descriptive, normative (prescriptive), and meta-ethics but some researchers added the applied ethics in this list. The easy way to explain the differences among these ethics models, the person should understand the questions used for explaining the each decision-making models: Descriptive ethics – what do people think is right? It is the study of people's beliefs about morality; Normative or prescriptive ethics – how should people act? It investigates the set of questions that arise when considering how one should behave; Meta ethics – what does 'right' even mean? It seeks to understand the nature of ethical properties, statements, attitudes, and judgment; Applied ethics – how do we take moral knowledge and put it into practice? It investigates specific controversial issues such as animal rights or nuclear war (Icheku, 2011).

Previous Research

Several researches were conducted to figure out how age, gender, amount of computer use and internet use influenced behaviors in real versus virtual environments. 64% of internet users said that their daily life activities would be affected if they could no longer use the internet (Fallows, 2004). Children and young people used of new interactive media and communication technologies more frequently and actively in their social lives and

everyday practices (Mitchell, Ybarra, & Finklehor, 2007). 13 and older people believed that it was more acceptable to upload or download software than 12 and younger. 51% of young people between ages 18 and 29 with internet access have downloaded music files without download permission. Moreover, 53% of youth between the ages of 12 and 17 have also downloaded music files to hard drive (Graziano & Rainie, 2001). Another research result showed that 88 percent of Americans used the internet daily base for different purposes changing based on gender, ethnicity and age (Fallows, 2004). The gender difference is the other factor to determine how behavior changes in e-environment. While 34 percent of men believed that it was acceptable to download copyrighted material without authorization, only 27 percent women agreed on. Moreover, music downloads rate among males is higher than females (Graziano & Rainie, 2001). Van Buren (2001) found the negative relationship between students' computer knowledge and following the school's culture of trust. Another research conducted in the UK by National Children's Homes, 14% of 11 to 19-year-olds children stated that text messages and images taken with mobile phone cameras were used to threaten and harass them (Burn & Cranmer, 2007).

A similar study was conducted by Poole in 2007 on 453 participants. In the study, when the groups were compared, the technology-based scenarios were more acceptable to the participants than the non-technology-based scenarios. There was a highly significant difference by age between the technology-based scenarios and the non-technology-based scenarios responses. Males were much more accepting of both the technology and non-technology survey scenarios than females. There was no difference in the scenario responses based on the number of hours of home computer use. Poole, also, found that the perceptions of the acceptability of the survey scenarios did not differ from the likelihood of actually performing the actions. Males were more likely than females to carry out the survey scenarios related technology and non-technology. The number of hours of home computer use had neither an impact on the likelihood of performing the technology-based actions, nor an impact on the responses of non-technology scenarios. Poole study showed that there was a greater discrepancy between what the participants felt was acceptable and what they were willing to do in among the technology and non-technology scenarios. Males responded more consistently regarding acceptability and likelihood of acting upon the survey scenarios than female. The number of hours of home computer use had an impact on the responses to the technology scenarios significantly. It means that if people use computers in increasing amounts, their actions may change. Poole, finally, said that individuals always will to engage in unethical behavior, technology seems to give them opportunity to do so.

Research Questions

The new decision-making studies are conducted in the light of new models under their concepts. Advanced communication technologies have changed people's perception of ethics and so the decision-making authority. Because of these changes, people have done many unethical things in the virtual environment. The primary purpose of this study is to investigate the prospective teachers' likelihood of performing unethical behaviors in the real and virtual environments. Following research questions have been developed for the study:

1- Is there a difference between likelihood of student's performing unethical behaviors in different environments?
2- Is there a difference between student's acceptability of performing unethical behaviors in different environments?
3- Do gender and internet usage affect likelihood of student's performing unethical behaviors in different environments?
4- Do gender and internet usage affect student's acceptability of performing unethical behaviors in different environments?

METHOD

The cross-sectional survey design (Creswell, 2002) is used in the study to investigate the research questions. Cross-sectional survey design is the most preferred form of survey design since the data are collected at one-point in a time.

Sample

The subjects for the study consisted of 352 (131male-221female) prospective teachers enrolled in the four-year teaching programs of the education faculty in two different universities. Subjects were selected voluntarily from prospective teachers.

Instrument

The survey developed by Poole (2007) is used in the study to collect the data from participants. The instrument has 22 scenarios. 11 scenarios have technology related items while the other 11 scenarios have non-technology related items. Survey respondents are asked to provide two ratings for each survey items using a five-point scale. The first rating is the likelihood of engaging the activities in each scenario. The second rating is the acceptability of the scenarios. Respondents' answers to each question are converted a number from 1 to 5.

Conducting the Survey

The survey instrument was originally on paper. Online version of the survey was developed to eliminate the potential risk for entering the data for analysis. Voluntarily participation of the undergraduate students studying at the school of education faculties of both universities was asked. Participants accepting to involve the study were completed the survey items. Then the file containing participants' responses were imported to the statistical analysis package (SPSS) for later analysis. All statistical analyses were conducted with a significant level of .05.

ANALYSIS

After the data collection phase, Cronbach Alpha coefficients were calculated to observe internal consistency of all scales. A reliability estimate of the likelihood of student's performing unethical behaviors in each environment was found 0.75 (virtual environment) and 0.78 (real environment). Also, reliability estimate of acceptability of performing unethical behaviors in each environment was found 0.77 (virtual environment) and 0.79 (real environment). Afterwards, Shappiro-Wilk normality test conducted to determine variables departure from normality or not. As a result, all variables are found not-normally distributed. Therefore, non-parametric statistics were used to analyze the data. The Wilcoxon Signed Rank Test was used to compare paired comparison of likelihood of student's performing unethical behaviors and acceptability of performing these unethical behaviors in technology and non-technology environments. Furthermore, the Mann-Whitney U-test was used to compare gender effect. Also the Kruskal Wallis H-test was used to compare internet and computer usage effect on likelihood of student's performing unethical behaviors and acceptability of performing unethical behaviors in technology and non-technology environments.

FINDINGS

Descriptive statistics and normality evaluations for likelihood of student's performing unethical behaviors and acceptability of performing unethical behaviors in different environments are shown in Table1.

Table-1. Descriptive Statistics and Normality Evaluations of Variables

Scale	Environment	M	Sd	Skewness	Kurtosis	P*
Likelihood of student's	Virtual	17.99	4.87	0.78	0.70	0.00**
performing unethical behaviors	Real	15.99	3.86	1.34	3.00	0.00**
Acceptability of performing	Virtual	17.52	4.95	0.91	1.17	0.00**
unethical behaviors	Real	15.68	3.98	1.41	3.32	0.00**

* Shappiro-Wilk test
** P< 0,05

Likelihood of student's performing unethical behaviors

The first research question investigated the whether there is a difference between likelihood of student's performing unethical behaviors in different environments. Median values of likelihood of student performing unethical behaviors in technology environments and in non-technology environments were 18.0 and 15.0, respectively. It is apparent from Table-2 that the likelihood of student's performing unethical behaviors in technology environments is more than in non-technology environment, Z=-11.643, p<0.00. Further analysis indicated that likelihood of student's performing unethical behaviors in technology environment has 241 median rank score greater than in non-technology environment.

Acceptability of performing unethical behaviors

The second research question investigated the whether there is a difference between student's acceptability of performing unethical behaviors in different environments. Median values of acceptability of performing unethical behaviors in virtual and real environments were 17.0 and 15.0, separately. The acceptability of performing unethical behaviors in virtual environments is more than in real environment, Z=-10.680, p<0.00. Results indicated that acceptability of performing these unethical behaviors in virtual environments has 229 median rank score greater than in non-technology.

Table-2: The comparison of likelihood and acceptability of performing unethical behaviors

	Virtual		Real			
	N	Mean of Negative Ranks	N	Mean of Positive Ranks	Z	P
Likelihood of student's performing unethical behaviors	241	170.92	64	85.52	-11.643	0.00*
Acceptability of performing unethical behaviors	229	160.36	63	96.11	-10.680	0.00*

* p<0.05

Gender and internet usage rate effects on likelihood of student's performing unethical behaviors

The third research question investigated whether the gender and internet usage affect likelihood of student's performing unethical behaviors in different environments.

Table-3: Comparison of the likelihood of student's performing unethical behaviors for gender and internet usage rate

			Likelihood of student's performing unethical behaviors			
Independent Variables	Categories	N	Virtual		Real	
			Mean Rank	P	Mean Rank	P
Gender	Male	131	197.99	0.00*	190.01	0.054
	Female	221	163.78		168.49	
Internet Usage	<2 hour	99	149.48	0.01*	153.54	0.02*
	2-4	104	180.17		184.86	
	4-6	52	199.44		200.85	
	6-8	47	168.85		155.63	
	8-10	23	210.65		192.76	
	> 10	27	201.46		204.11	

* P<0.05

Gender effect in virtual environment

Results indicated that likelihood of student's performing unethical behaviors in virtual environments is greater for men than women, with a mean rank of man's score 197.99, for woman 163.78, U=-3.057. p=.002. r=.50.

Internet usage effect in virtual environment

The result indicated that likelihood of student's performing unethical behaviors in virtual environments was greater for using 8 hours or more using internet in a week than the other categories. x^2(5. N=352) = 14.320. p=.01.

Gender effect in real environment

Finding indicated that likelihood of student's performing unethical behaviors in real environments did not differ by gender preferences. Additionally, mean rank of man score is 190.91 and woman score is 168.49, U=-1.927, p=0,054.

Internet usage effect in real environment

Finding indicated that likelihood of student's performing unethical behaviors in real environments was greater for 4-6 hours and 10 hours and more using internet in a week, x^2(5. N=352) = 13.411. p=.02

Gender and internet usage rate effects on acceptability of performing unethical behaviors

The fourth research question investigated whether the gender and internet usage affect student's acceptability of performing unethical behaviors in different environments.

Table-4. Comparison of the acceptability of performing unethical behaviors for gender and internet usage rate

			Acceptability of performing unethical behaviors in different environments			
Independent Variables	Categories	N	Virtual		Real	
			Mean Rank	P	Mean Rank	P
Gender	Male	131	189.16	0.071	183.76	0.301
	Female	221	168.99		172.2	
Internet Usage	<2 hour	99	152.12	0.074	163.79	0.484

2-4	104	178.13	180.01
4-6	52	190.33	185.76
6-8	47	182.03	165.27
8-10	23	206.43	198.87
> 10	27	197.85	192.24

Gender effect in virtual environment
Results indicated that there was no significant effect on students' acceptability of performing unethical behaviors in different environments, U=-1.803, p=0,07.

Internet usage effect in virtual environment
The result indicated that students' acceptability of performing unethical behaviors in virtual environments did not differ by internet usage time in a week, $x^2(5. N=352) = 10.044. p=.07$.
Gender effect in real environment

Finding indicated that gender was not affected students' acceptability of performing unethical behaviors in real environments, U=-1.035, p=0,30.

Internet usage effect in real environment
It is apparent from findings that internet usage rate was not affected students' acceptability of performing unethical behaviors in real environments, $x^2(5. N=352) = 4.472. p=.048$.

CONCLUSION AND RECOMMENDATIONS

Individuals are more dependable on computer technologies than ever before. Consuming significant time on computers particularly for communication purposes have brought ethical issues. The changes in the society as a result of the introduction of new technologies have triggered the emergence of new beliefs and values (Kabakçı and Odabaşı, 2003; Masrom et al., 2008). The effects of communication technologies on individuals and on the society are still under investigation. This study was designed to add a contribution to body of knowledge on ethics in the new environment by illuminate the question that whether there is a difference in the prospective teachers' likelihood of performing unethical behaviors in the real and virtual environments.

Virtual environments have become part of individuals' life in the last decade. Tools available at virtual environments provide numerous options for individuals primarily for communication and entertainment. Identical to the real world individuals' can do behaviors that are unethical in virtual environments. Findings of this study revealed the fact that prospective teachers are more likely to perform unethical behaviors in virtual environments than real environment. The virtual environment frequently used for communication seems to negatively affect the prospective teachers' behaviors. Another astonishing finding of the study was that prospective teachers' acceptability of performing unethical behaviors in the virtual environment is higher than the real environment. What are the driving forces affecting individuals to perform and/or accept performing unethical behaviors in the virtual environment? Further research needs to investigate the underlying causes of this change. The finding of the study has brought a new concern on teacher education since prospective teachers will be role models for young generation. The virtual environment apparently will be the mean of communication in following decades. Therefore special cautions need to be taken to diminish the acceptability and the likelihood of performing unethical behaviors in the virtual environment primarily on prospective teachers and society at large. Another key finding of this study was that the likelihood of students' performing unethical behaviors in virtual environments is greater in men than women while no difference was found in the real environment. Why does gender difference exist in virtual environment? In-depth qualitative studies should be planned to investigate the reasons in the future.

REFERENCES

Akdemir, O. (2008). Teaching in Online Courses: Experiences of Instructional Technology Faculty Members. *The Turkish Online Journal of Distance Education*, 9, 2. p. 97-108.

Ahmed, E. (2002). Information technology and social change. *Minnesota Futurists, 26*(3/4), 102-104.

Beresford, B. and Sloper, P. (2008) *Understanding the dynamics of decision-making and choice: A scoping study of key psychological theories to ınform the design and analysis of the panel study*, York: Social Policy Research Unit, University of York.

Burn, A., & Cranmer, S. (2007). A glass half full? Schools and young people's Internet use in the UK. In K. M. Ekström & B. Tufte (Eds.), *Children, media and consumption: On the front edge* (pp. 79–92). Göteborg, Sweden: International Clearinghouse on Children, Youth and Media/UNESCO.

Business Software Alliance (2004a). New survey shows that teens are more likely to illegally download than tweens, URL (consulted June 2014): http://www.prnewswire.com/news-releases/new-survey-shows-that-teens-are-more-likely-to-illegally-download-than-tweens-74224392.html

Business Software Alliance (2004b). Teaching cyber ethics to America's youth should begin @ home survey says, URL (consulted June 2014): http://www.ipsos-na.com/news-polls/pressrelease.aspx?id=2106

Callahan, D. (2004). *The cheating culture: Why more Americans are doing wrong to get ahead.* Orlando, FL: Harcourt.

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Upper Research, N.J.: Merrill.

De Waal, F. (1996). *Good natured: The origins of right and wrong in humans and other animals*. Cambridge, MA: Harvard University Press.

Fallows, D. (2004) 'The Internet and Daily Life', Pew Internet & American Life Project, URL (consulted June 2014): http://www.pewinternet.org/files/old-media/Files/Reports/2004/PIP_Internet_and_Daily_Life.pdf.pdf

Graziano, M. and L. Rainie (2001) 'The Music Downloading Deluge', Pew Internet & American Life Project, URL (consulted June 2014): www.pewinternet.org/files/old-media/Files/Reports/2001/PIP_More_Music_Report.pdf.pdf

Haidt, J. (2006). *The happiness hypothesis: Finding modern truth in ancient wisdom.* New York: Basic Books.

Hauser, M. (2006). *Moral minds: How nature designed our universal sense of right and wrong*. New York: Harper Collins.

Icheku, V. (2011). *Understanding ethics and ethical decision-making*. Bloomington, IN: Xlibris Corporation

Ince, M., & Akdemir, Ö. (2013). The investigations of using web 2.0 technologies on English writing skills of students with different learning styles. *Eurasian Journal of Educational Research*, 53/A, 93-106.

Kabakçı, I. and Odabaşı, H. F. (2003). Bilgi toplumunda altı şapkalı öğretmen. *Anadolu Üniversitesi Eğitim Fakültesi Dergisi, 13*(1), 97-103.

Klein, G. (1998). *Sources of power: How people make decisions*, MIT Press, Cambridge (MA).

Kreitner, R. and Kinicki, A. (2001). *Organizational behavior, 5th Edition*, Irwin McGraw Hill, Burr Ridge (IL)

Madden, M. and Rainie, L. (2005). Music and video downloading moves beyond P2P, Pew internet & American life project, URL (consulted June 2005): http://www.pewInternet.org/pdfs/PIP_Filesharing_March05.pdf/

Mason, R O. (1986). Four ethical issues of information age. *MIS Quarterly, 10*(1), 5-11.

Masrom M., Ismail Z., & Hussein R. (2008). Computer ethics awareness among undergraduate students in Malaysian higher education institutions. *19th Australasian Conference on Information Systems*, 3-5 Dec 2008, Christchurch, 628-637.

Mitchell, K. J., Ybarra, M., & Finkelhor, D. (2007). The relative importance of online victimization in understanding depression, delinquency, and substance use. *Child Maltreatment, 12*(4), 314–324.

Moor, J. H. (2004). Reason, relativity and responsibility in computer ethics. In T. W. Bynum & S. Rogerson (Eds.), *Computer Ethics and Professional Responsibility*. Blackwell Publishing.

Mullen H. & Horner, D. S. (2004). Ethical problems for e-government: An evaluative framework. *Electronic Journal of e-Government*, *2*(3), 187-196.

Ng, W. (2008). Virtual teamwork: Students studying about ethics in an online environment. *Research in Science & Technological Education*, *26*(1), 13-29.

Poole, D. (2007). A study of beliefs and behaviors regarding digital technology, *New Media & Society, 9*(5): 771-793.

Quinn, M.J. (2005). *Ethics for the Information Age*. Boston, MA: Pearson Education.

Sadowski, S. T., & Thomas, J. R. (2013). An Overview of Global Ethics for Educators and Practitioners in the Professional Field of Accountancy. *Applied Finance*, 416-428.

Simon, H. A. (1997). *An empirically based microeconomics*, Cambridge, UK: Cambridge University Press.

Stewart, M. (2000). The classroom, board room, chat room and court room: School computers at the crossroads, *School Business Affairs, 66*(9), 23.

Stichler, R. and Hauptman, R. (1998). *Ethics, information and technology: Readings*. Jefferson, NC: McFarland & Company.

Turiel, E. (1983a). Domains and categories in social cognitive development. In W. Overton (Ed.), *The relationship between social and cognitive development* (pp. 53–90). Hillsdale, NJ: Erlbaum.

Turiel, E. (1983b). *The development of social knowledge. Morality and convention*. Cambridge, MA: Cambridge University Press.

Turpin, S. M., & Marais, M. A. (2004). Decision-making: Theory and practice, *The Operations Research Society of South Africa 20*(2), 143-160.

Uysal, Ö. & Şendağ, S. (2006) *Öğretmen adaylarının bilgisayar etiğine ilişkin görüşleri.* Yayınlanmamış Yüksek Lisans Tezi. Anadolu Üniversitesi Eğitim Bilimleri Enstitüsü, Eskişehir.

Van Buren, C. (2001). Teaching hackers: School computing culture and the future of cyber-rights, *Journal of Information Ethics 10*(1): 51–72.

Willard, N. (2001) *Computer ethics, etiquette and safety for the 21st-century student.* Eugene, OR: International Society for Technology in Education.

Wong, E. (1995). How should we teach computer ethics? A short study done in Hong Kong, *Computers in Education 25*(4): 179–91.

Woodbury, M. (2003) *Computer and information ethics.* Champaign, IL: Stipes Publishing.

Reflection Tools in Teacher Education Classes: An Analysis of Implementation in Online, Hybrid, and Traditional Environments

Amy M. Williamson
Program Manager, Graduate Teacher Certification, Director, CAEP
Editor, Journal of Teaching Effectiveness and Student Achievement
Angelo State University, ASU Station #1092, San Angelo, TX 76909
amy.williamson@angelo.edu

Ann Mears
Angelo State University, ASU Station #1092, San Angelo, TX 76909

Charlene Bustos
Angelo State University, ASU Station #1092, San Angelo, TX 76909

ABSTRACT
This paper will introduce the nature of reflective tools in online, hybrid, and traditionally formatted teacher education courses. The specific context of implementation and impact on the quality of reflection for teaching candidates will be discussed. Examples of assignment prompts and recommendations for future use will be shared.

Keywords: blogs, e-learning, teacher education, reflection, discussion boards

TECHNOLOGY AND TODAY'S LEARNER
Current data indicates that the United States has almost four million students enrolled in online learning (Allen & Seaman, 2008). This number surpasses the enrollment in the traditional campus setting. So what constitutes this large number and what is the big draw? Research states that online classes can prove to be less intimidating, and those students can experience a sense of flexibility when facing overwhelming daily challenges such as work or family demands (Robinson & Hullinger, 2008; Zhou & Zhang, 2008). Our modern lives are creating less time to spend on educational programs, so we need to find ways that will accommodate our busy lives. With technology becoming more and more integrated into our lifestyles, it is plausible we would engage in more online offerings (Ozkan, 2010).

Preparing teachers who can effectively meet the needs of today's schools is a challenging task. In an effort to accomplish that task, more and more universities are expanding their education programs to include online certificates, courses, and degrees. When compared to face-to-face instruction, ratings for online teacher preparation programs have been found to be higher, as a result of more innovative online teaching and learning practices (Chiero & Beare, 2010).

Today's learner thinks and processes information differently from their predecessors (Prensky, 2001). The Millennial generation typically uses technology to learn more fluently than their counterparts, and making learning creative is important to their achievement in the classroom (Teaching Tips, 2011).

Online learning is a solution for engaging 21st century learners and for preparing them for the classroom where they will have to be technologically savvy. In addition, online programs offer flexibility to students and to professors, increasing opportunities for learners to experience classroom observations and practice teaching.

PRODUCING REFLECTIVE PRACTITIONERS
According to Larrivee (2006), reflective practice can be viewed as "the culmination of all other forms of reflection in that it is undertaken not solely to revisit the past but to guide future action" (p. 5). While courses with opportunities for pre-service teachers to "practice" appear infrequently in teacher education programs, several required pedagogy and strategy courses lend themselves to set the stage or foundation for reflective practice. Working with and educating pre-service teachers (or trainee teachers) provides university professors the opportunity to guide pre-service teachers to develop their ability to engage in reflection – reflection on professional readings, reflection on classroom observations, and reflection on their own teaching practices.

Collaboration with peers offers an extension of this reflective process which, according to Parsons & Stephenson (2005), includes a wider range of understanding and perspectives. In addition, learning to reflect affords these pre-service teachers the experience of drawing on a wider range of knowledge and understanding--reflection in

which they draw upon their metacognitive knowledge and skills (Parsons & Stephenson, 2005, pp. 98-101). Moreover, frequently asking students to "discuss together an aspect of practice they have observed or experienced, or read about" appears to encourage dialogue without the pressure of a specific reflective activity (Parsons & Stephenson, 2005, p.104). Using online discussion boards and blogs stimulates such collaboration and discussion. Reflective collaboration using the knowledge-building framework facilitates the process of student articulation and documentation of their development (Chitpin, 2006, p. 81).

By designing assignments that require college students to describe what they have learned, professors demonstrate essential elements for preparing all students to be self-regulated learners through responsibility for describing what they have learned (Parsons & Stephenson, 2005, p. 101). In turn, pre-service teachers have practiced and learned key strategies for designing similar lessons for their future students to assist them in becoming self-regulated learners. Through a growing understanding of their own values and beliefs—developing an increased awareness of their learning—metacognition strengthens.

While it is simple for a professor or teacher to tell students "Reflect on what you have read" or "Reflect on the lesson you just observed," reflection assignments need to be structured within an explicit framework that allows students to experience the "process of reflection" through clearly defined situations (Parsons & Stephenson, 2005, p. 104). Professors need to develop set of focus questions for pre-service teachers to respond to during their reflection. This "guided reflection framework" is useful in the development of reflection using prompts to help students to regulate and monitor their cognition (Parsons & Stephenson, 2005, p. 104).

Research conducted by Parsons and Stephenson (2005) reflects comments from teachers who engaged in reflective collaboration: tasks led to "deeper thinking about what was actually happening" and they "brought into focus issues which could have been lost" (p.113). Another teacher comments that the tasks were helpful because they allowed the students "to observe and develop specific areas rather than doing general observations" (Parsons & Stephenson, 2005, p. 113). Such comments support the importance of providing quality opportunities for our pre-service teacher candidates to develop the process of critically reflecting on their experiences – a process that does "not come naturally to most teachers" (Yang, 2009, p. 12).

Perceiving "reflection" as a knowledge-building framework sets the stage for students to go "beyond description of incidents and issues, and to explore different perspectives, alternative ways of understanding and responding" (Chitpin, 2006, p. 80). Chitpin (2006) further tells us that reflection aids in identifying learning derived from specific experiences and allows us to then determine courses of action for achieving certain objectives (p. 80).

BENEFITS OF BLOGS

The interest in new media for teaching and learning has highlighted the potential of innovative software and hardware for education. This has included laptops, handhelds, wireless systems and Web-based learning environments. Most recently, however, this interest has focused on blogs and blogging (Ferdig & Trammell, 2004). With such a wide range of opportunities to promote learning comes a special challenge of how to operationalize educational blogging (Dent & Yuen, 2009). The open, flexible nature of blogs encourages dialogue among the discussion participants (Richardson, 2003).

Paper-based journals have been used extensively in promoting individual reflection in learning. It is argued that blogs share with these traditional journals the affordances for reflective thinking and have the potential to excel as tools for promoting learning by enabling peer interaction and collaboration (Hall & Davison, 2007). However, while the use of blogs and varied interactive instructional technologies is increasing in online environments, little research exists on the benefits of blogs. Research does support, however, the need for interactivity in online classrooms, and the importance of critical reflection for teachers' professional growth. Successful teachers are fully engaged in the reflective process. In addition, they are intentional, responsible, and committed to growing professionally throughout their careers. Finally, to improve their own performance, they make time to consider what they do day-to-day (Corcoran & Leahy, 2003).

NATURE OF COURSES

Course #1: The Reading in the Secondary Content Areas course is an online, required course for teaching candidates seeking secondary or all level certification. Its course description designates the course as one that, "incorporates the study of reading skills, learning and study and higher level thinking skills development in the content areas. The course covers the readability of curriculum materials, adapting learning experiences, planning curriculum to accommodate student diversity in reading ability, and assessing student learning" (University, 2012). This is the only reading course required for these candidates. Therefore, its emphasis lies in

practical implementation of reading, writing, and vocabulary strategies for content area classrooms. There is a 15-hour field component required for the course. The class included in this study had 35 students.

Course #2: Reading in the Content Areas, K-8 is a face-to-face course that is required of all elementary education majors. It is usually among the first education courses that these majors take. The course emphasizes instructional techniques and materials that can be used in the teaching of reading across the disciplines. The class that participated in the study had 13 students.

Course #3: Social Studies: The Instructional Strategies for the Elementary & Middle School Teachers is a face-to-face course with a field-based practicum component that emphasizes the integration of research and theories about the processes of learning social studies in the elementary and middle school. This is a required course for all K-8 education majors and ECH-12 special education majors. Problem solving, critical thinking, and citizenship are stressed. Additionally, emphasis is placed on integrating social studies with reading and literacy to include a variety of reflective writing assignments. Initial reflections are individual writing assignments turned in to the professor. While out in the field, pre-service teacher candidates reflect using Discussion Board threaded discussions. This online component appears extremely beneficial in providing support to the teacher candidates and opportunities to expand their learning as they view and respond to experiences of their peers. There were 41 participants in this course.

IMPLEMENTATION OF BLOG IN ONLINE COURSE

In this course, referred to previously as Course #1, the blog had two purposes: 1) To introduce future teachers to ways they could integrate technology into their own classroom, and 2) To give them an opportunity to simultaneously reflect on and collaborate with peers regarding their field experiences. Candidates were given an open-ended prompt initially that asked them to share their experiences, observations, and suggestions for what they viewed in their classroom observations. The prompt utilized for this blog was as follows:

> *Greetings, future teachers! This blog has been created so that you, (course #) students, can ask questions, discuss strategies, and comment on past and future teaching experiences regarding reading in the content areas. Please use this blog as a place to share strategies you are excited to use, as well as those you would like to learn more about. I look forward to reading what you have to say! Please include insightful, proofread blog posts of at least 150 words or more. Additional instructions on timing of posts, creating an account, etc. are posted for students in Blackboard.*

As time with the blog progressed, candidates were encouraged to think about what was working in the lessons from their classroom observations, what was not, and how they would teach something differently, or enhance a lesson, through the use of reading, writing, and vocabulary strategies. Candidates were given a span of six weeks to blog, during which at least two posts were required. Students could not make back-to-back posts and should have posted over a span of at least two weeks so they had new experiences to share. In addition, the instructor reviewed the posts each week and facilitated the conversation through a response and additional questions for them to consider. The blog in this course was created using Blogger.com.

IMPLEMENTATION OF BLOG IN TRADITIONAL ENVIRONMENT

In this course, previously referred to as Course #2, students were required to read five trade books in each of the following content areas: science, social studies, math, and English/language arts. Each student wrote an initial blog entry discussing what they noticed about the instructional applicability of the books they read and posted the entry. The candidate then responded to the initial posts of four of their class peers. The specific blog prompt for this blog assignment was as follows:

> *The English/Language Arts Books Discussion will be held using a Blog format. All class members are blog members with the capability of submitting blog entries and comments.*
>
> *Grading requirements and submission requirements have changed because of the features available through the blog. For this book discussion, annotated bibliographies will be graded and recorded in the Grade Center separate from the blog; the annotated bibliography remains worth 15 points and for this assignment may contain one novel, one book of poetry, one ABC book, and 2 books that relate to writing, spelling, grammar, punctuation, or other language arts topics. The blog portion of the assignment will be graded through Blackboard. Candidates are required to make a blog entry (10 pts) and to make comments on the entries of four of their peers (2.5 pts each for a total of 10 pts). In total, the blog assignment will be worth 20 points.*
>
> *Blog entries should present your basic analysis and evaluation of the 5 books that you read for this assignment. I encourage you to express yourselves fully and completely in your entries. The more detail that you provide in your blog entry the easier it will be for other group members to put themselves into your shoes and submit meaningful comments. After all members have had an opportunity to post their*

entry, then each blogger should come back into the blog and submit comments to four of their peers. Make text-to-text connections between books read or topics addressed. Feel free to ask each other questions when you don't understand a comment, an allusion, or a word. The only dumb questions are the unasked ones!

Each blog member is expected to post their blog entry between __ and __. Blog comments should be posted between __ and ___.

The tone of entries and comments should be courteous, respectful, insightful, and encouraging. Alternative viewpoints are welcome. No texting language or abbreviations allowed. It would be a good idea to proofread entries before submitting them. Mechanics do count. No late entries or comments accepted.

The time span between initial entries and reply comments was brief (2-5 days). Some students expressed difficulty with remembering to re-enter the blog to post reply comments.

IMPLEMENTATION OF DISCUSSION BOARD IN HYBRID COURSE

In this course, referred to as Course #3, teacher candidates were given two reflection assignments to be accomplished during the face-to-face portion of the semester (about five weeks). The first reflection was related to a professional article that the instructor assigned; therefore, all students read the same material, prepared their reflection on in a Word document, then brought to class and shared their responses.

The second reflection provided the teacher-candidates the opportunity to locate a professional journal article of their interest, then write the reflection and bring to class to share. The final two reflections were accomplished within the Discussion Board component of Blackboard. Each teacher-candidate was to write an initial post, then respond to the posts of three of their peers.

The discussion board prompt utilized for this assignment was as follows:

Please consider your recent Social Studies teaching experiences. Think about the students in your group and/or classroom--and consider several "positive or enlightening student responses" that you have observed. For example, "responses" do not need to be verbal--they could be facial expressions or body language--small chats between students--displaying how the student(s) feel about the assignment or what they are learning.

Now--choose JUST ONE of these positive responses, and post your comments in this Discussion Board.

Next--read some of the other teacher candidates' posts--and comment on two (2) of your peers' statements.

YOU'RE DONE!!! Enjoy!

RESULTS OF IMPLEMENTATION

Course #1

The instructor noted excitement on behalf of some learners to utilize a new tool in the online class. Other, less technologically savvy or unfamiliar learners exhibited frustration for the same reason. It should be noted that it is often assumed college students of the current generation of students have access and experience with a number of technologies. That is not always the case, as this instructor discovered.

The blog yielded more insightful responses as a result of a more open-ended blog prompt, in some cases. The instructor found that the blog provided a more open forum of discussion, compared to inhibited discussion board forums. In addition, a higher quality of reflection was produced from students, as they used the prompt to guide their field work observations and focus their attention in the classroom. Finally, the instructor noted what appeared to be less forced, and more authentic, peer feedback in the blogs, compared to previous experience with other reflection tools like discussion boards.

Course #2

The blog entries and response posts gave the instructor visible evidence of the quality of discussion that ensued. The quality of the initial post affected the quality of the peer responses. The better initial entries drew better peer responses and were more frequently responded to than poorer quality initial entries. Increased instructor direction and the provision of instructor examples improved the quality of both initial entries and peer responses. The last day of class students were asked to evaluate the three different methods of book discussion (face-to-face,

discussion board, blog) that were used during the course of the semester. Students preferred face-to-face discussion because of the direct interaction, which allowed students to give and receive immediate feedback in the form of oral questions, facial expressions, and body language. Students also noted that they enjoyed being able to see and handle the actual books.

Students in this elementary reading class noted the following positive aspects to using blogs as a modality for discussion: Every student could see every other student's entry, allowing students to read other posts before writing her own. They enjoyed being able to choose whom they responded to and liked the flexibility in timing that the blogs encouraged.

These students noted minor problems with use of a blog as a modality for discussion: Some students noted lack of home Internet access and lack of experience with blogging as a means of communication. Others missed the interaction of the face-to-face discussion. Some complained that the discussion turned into a writing assignment. Some students noted problems with remembering to re-enter the blog in order to post peer responses. Some thought the initial entries tended to be lengthy and repetitive.

Course #3:
The instructor noted a relaxed form of writing within the Discussion Board assignments that reflected excitement about teaching and the responses of their students (across grade levels, K-8th). Initial posts reflected what teaching strategies were successful and provided insight into some that required modification. Sincere comments revealed an increased awareness of the importance of using manipulatives at all grade levels and a surprised recognition that even sixth graders had a desire to learn. Teacher-candidates utilized positive phrases when responding to their peers, providing encouragement and support for the quality of teaching that had been accomplished. The second discussion board assignment revealed an improved quality of initial posts.

RECOMMENDATIONS FOR FUTURE USE

Based on the implementation of blogs and discussion boards in these three classes, the researchers have reached the following recommendations for future use:

- Limit blog pages to 20 students.
- Provide a longer span of time for students to use blog on a continuous basis.
- Allow students to add video of their reflection or classroom teaching to their blog posts for visual enhancement and further collaboration and commentary by peers and instructor.
- Be sure the prompt used is reflective of the type of posts and responses you want.
- Increase the number of required posts.
- Point out the importance of the blog reflection, and of reflective practice in general, to candidates prior to the blog assignment.
- Model setting up an account and blog posts for candidates.
- Assign student facilitators for each week of blog usage.

CONCLUSIONS

The author's implementation of blogs and discussion boards provided them with a better understanding of the types of prompts that promote collaboration and reflection, the most appropriate context for using reflective tools, and necessary steps for making future use of these tools more effective in the classroom. Candidate reflections and instructor observations indicated that students' writing appeared to be more relaxed, they shared encouragement with their peers, and generally provided quality responses. In some cases, however, students needed additional understanding of the assignment or the technology required to complete their posts. As technology continues to advance and teacher education courses continue to evolve in format, it is important for instructors to be aware of ways to keep their candidates engaged and prepared for 21st century classrooms. Blogs and discussion boards are two venues that educators can utilize to ensure this growth occurs.

REFERENCES

Allen, I. E., & Seaman, J. (2008). Staying the course: Online education in the United States, 2008. Needham, MA: Sloan Consortium.

Chiero, R., and Beare, P. (Dec 2010). An Evaluation of Online versus Campus-Based Teacher Preparation Programs. *Merlot Journal of Online Learning and Teaching, 6,* 4.

Chitpin, S. (2006). The use of reflective journal keeping in a teacher education program: A Popperian analysis. *Reflective Practice 7(1),* pp. 73-86.

Corcoran, C.A. & Leahy, R. (Fall 2003). Growing Professionally through Reflective Practice. *Kappa Delta Pi Record.* 30-33.

Deng, L. and Yuen, A.H.K. (2009). Blogs in Higher Education: Implementation and Issues. *Tech Trends, 53* (3). 95-98.

Ferdig, R.F. and Trammell, K.D. (2004, February). Content Delivery in the 'Blogosphere.' *T.H.E. Journal, 31* (7). 12-20. Retrieved from ERIC Database.

Hall, H., & Davison, B. (2007). Social software as support in hybrid learning environments: The value of the blog as a tool for reflective learning and peer support. Library and Information Science Research, 29(2), 163-187.

Larrivee, B. (2006). *An educator's guide to teacher reflection.* Boston, MA: Houghton Mifflin.

Ozkan, H. H. (2010, Spring). Cooperative learning technique through Internet based education: A model proposal. Education, 130(3), 499-508.

Parsons, M. & Stephenson, M. (2005). Developing reflective practice in student teachers: collaboration and critical partnerships. *Teachers and Teaching: theory and practice, 11(1),* pp. 95-116.

Richardson, W. (2003). FAQ–How do Weblogs impact learning? Retrieved from http://www.Weblogg-ed.com/stories/storyReader$414.

Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business, 84*(2), 101-108.

Teaching Tips. (2011). Honolulu Community College Faculty Development. Retrieved on September 22, 2011 from: http://www2.honolulu.hawaii.edu/facdev/guidebk/teachtip/GenY.htm. University. (2012). Undergraduate Catalog, 2012-2013.

Yang, S.H. (2009). Using blogs to enhance critical reflection and community of practice. *Educational Technology & Society, 12(2),* pp. 11-21.

Zhou, L., & Zhang, D. (2008). Web 2.0 impact on student learning process. In K. McFerrin, R. Weber, R. Carlsen, & D. A. Willis (Eds.), Proceedings ofsociety for information technology and teacher education international conference 2008 (pp. 2880-2882). Chesapeake, VA: Association for the Advancement of Computing in Education.

Restrict or Share the Use of the Interactive Whiteboard? The Consequences on the Perception, the Learning Processes and the Performance of Students within a Learning Sequence on Dynamic Geometry

Natacha Duroisin
Research Fellow F. R. S. - FNRS
Service of Methodology and Formation/University of Mons, 18, Place du Parc, B-7000 Mons
natacha.duroisin@umons.ac.be

Gaëtan Temperman
Service of general pedagogy and educational Media/University of Mons
18, Place du Parc, B-7000 Mons
gaetan.temperman@umons.ac.be

Bruno De Lièvre
Service of general pedagogy and educational Media/University of Mons
18, Place du Parc, B-7000 Mons
bruno.delievre@umons.ac.be

ABSTRACT
The aim of this study is to analyse the impact of the shared use of the interactive whiteboard (IWB) on the perceptions, learning processes and performance of learners. It was carried out with lower secondary school students within the context of a class on dynamic geometry. The work is based on a set of indicators and the results were obtained from quantitative data, which was collected through a written questionnaire, and from qualitative data, which was collected through encoded video recordings. These results show that sharing the use of the interactive whiteboard has an impact on the perceptions of learners in terms of the usability and usefulness of the tool, that it encourages interactions between the students and that it seems to have a positive effect on the efficiency of the learning sequence itself.

Keywords: Interactive whiteboard, shared use, teaching/learning process, interactions, perception of the learners.

1. TOWARDS 'THOUGHTFUL USE' OF THE INTERACTIVE WHITEBOARD
For over twenty years, many researchers have been studying the use of information and communication technology (ICT) in schools. Several authors (Depover *et al.*, 2007; Karsenti *et al.*, 2002) show that simply using technology does not guarantee its educational effectiveness, while others, including Poyet (2009), indicate that contexts and teaching situations are the key factors for the effectiveness of ICT in teaching practices. Having already been used in companies for many years, interactive whiteboard (IWB) usage has been increasing for several years in classrooms in England, Australia and Mexico. In 2011, in Europe and North America, IWB was one of the most popular technological supports for teaching and learning in different disciplines. Governments, understanding the value of using such tools in the classroom, have already accepted integrating this technology into educational settings. Recently, studies both confirming and refuting the potential impacts of the tool have been conducted, and the results are far from unanimous.

Studies (Miller & al., 2002; Jeunier et al., 2005; Kennewell & Beauchamp, 2007; Lee, 2010 ; Tataroglu & Erduran, 2010; Bidaki & Mobasheri, 2013) show that the use of IWB by students led to both a higher degree of motivation and level of participation, others (Levy, 2002; Wall, Higgins & Smith, 2005; Merrett & Edwards, 2005; Glover et al., 2007; Karsenti, Collin & Dumouchel, 2012) maintain that the motivational effects fade away quickly and are more related to the novelty effect of the tool. Others (Slay *et al.*, 2008) highlight that the originality of the support may be a source of motivation but educational value must be more important to perpetuate its effects. Concerning the quality of learning, here again the results are not unequivocal. Glover and al. (2001) and Becta (2003) indicate that this support does not induce differences in overall performance while others (Somekh et al., 2007) observed an improvement in students' performances.

Few studies to date relate the impact of the ways of using the IWB from an experimental point of view. This study was conducted in an attempt to provide some possible answers to this problematic situation. The effects of a 'shared usage' of the interactive whiteboard with learners in comparison with a 'restricted use' for the teacher are analysed. The objective is to evaluate the impacts of the use and usability of the tool on the progress of the students, the teaching / learning process and the perceptions of learners. The independent variable considered in

this study distinguishes between the use of the IWB being strictly reserved for the teacher in one group and the sharing of the material between the students and the teacher in a second group of learners. Given that the teaching and learning is based on a pedagogical script that integrates the IWB differently, differences on several levels are to be expected.

On the level of the students' perceptions, it can be assumed that the shared use of the support will have a motivational effect in comparison to the teacher only use. It is also expected that the types of privileged interactions during the course will depend on the mode of use of the media. Finally, the hypothesis that the performance between students of the two groups formed will differ will also be considered. In other words, the aim of this study is to identify and compare, in a specific context and with specific mathematical content, the most appropriate conditions for getting the maximum value out of the interactive whiteboard, from a pedagogical point of view.

2. EXPERIMENTAL CONTEXT

This study was conducted at a technical college, as part of a mathematics course which is taught five hours per week to students of the second year of secondary school (about 13-year-old students). A teaching sequence was given to students over five hours. It consisted of a script and three different activities with the IWB. The material chosen for the sequence focused on the axes and centres of symmetry. For the simulation exercise, students were put in pairs and had to form two piles of playing cards. Without instructions or advice, it was expected that students would distinguish the difference between the cards with or without an axis or a centre of symmetry. As mentioned previously, three activities were proposed: the first consisted of asking students to make a line, to complete a representation of letters using orthogonal symmetry, to find the letters in the alphabet having an axis and/or a centre of symmetry and to determine whether the logos presented had one or more axes and a centre of symmetry. The second activity required the students to identify the axes and the centres of symmetry of known geometric figures and then infer proposed rules that can be taken from the case presented. The third activity involved two tasks where students are asked to identify the axes and centre of symmetry of regular polygons. Apart from the differences in the experimental design of the methodology (handling or non-handling of the tool by the student), the course was the same in each class.

3. DISTINCTION BETWEEN THE TWO WAYS OF USING THE INTERACTIVE WHITEBOARD

The aim was to observe the differences in the learning/teaching process and the in performance due to the experimental process itself. Therefore, the teacher had to carefully follow the instructions of the developed pattern. Only differences regarding the methodology were planned. The two groups were formed on the basis of Warren's statement (2002) according to which two ways of using the IWB were mainly implemented by the teachers. The first group (experimental group) consisted of two classes (N=24) of learners who used the interactive tool repeatedly during the lesson (this is called 'shared use of the IWB' with the learners). 'Shared use' of the interactive tool means that all the learners use the interactive whiteboard on a voluntary basis or after being asked by the teacher. Different activities were given to the learners (construction of figures, removal of objects, etc.) in order to confront them with the different possibilities of the IWB. These activities were mainly taken from the book *Actimath* (Bams et al., 2014). The teacher and the students used the manual, which the teacher had digitised in order to make it readable on the IWB. The related CD-Rom was used as a correction tool. While the learner used the IWB, the teacher and the other students were available for confirmation and/or to offer some assistance. There were no restrictions on another volunteer going up to the IWB depending on requests from the others. During the five hours of the experiment each learner used the interactive tool an average of ten times with an average total duration of eighteen minutes. The second group (control group) consisted of one class (N=11) that attended the same course using the same tool. The only difference was that only the teacher used the whiteboard (this is referred to as 'exclusive use of the IWB' by the teacher).
In order to maintain the ecological validity of this study, it was decided to keep the composition of the three classes and to form two different quasi-experimental groups.

4. TEST PATTERN AND METHODOLOGY

Based on the work of Beauchamp & Parkinson (2005) and Cohen (2007), the main hypothesis for this study is that sharing the use of the IWB between the teacher and the students can favourably impact both the perception of the learners and the teaching and learning processes that are implemented during the learning sequence. In other words, this study analyses the impacts of a 'shared use' of the interactive whiteboard on the motivation of the students, on the preferred means of interaction and on performance. A pattern to observe the use of the tool within a real learning context was set up in order to confirm or invalidate the hypotheses. It is based on a quasi-experimental plan which is structured in three successive stages (Table 1). A pre-test was carried out in which the learners were required to perform 8 exercises about axes and centres of symmetry without any precise information about the purpose of the experiment. For the first two sub-exercises, they had to complete the

construction of geometrical figures by using orthogonal symmetry. During the second activity, the learners were shown two road signs. The students indicated if there were one or more symmetrical axes with or without a centre while specifying how many. For the next activity, the students were given two kinds of figures (with secant and parallel segments) on which they had to draw the axis or axes, and in some cases the symmetrical centre. For the last activity, the students had to move shapes and/or segments in a way that the given line(s) corresponded to the symmetrical axis or axes. For each of the sub-exercises a grade was given in terms of raw score. These grades were added up so that a relative gain in performance could be calculated. After that, the teacher gave a five-hour learning sequence based on a pattern with a precise methodology to apply. Finally, all the students performed a 'post-test' using the same protocol applied during the 'pre-test'. The whole experiment was filmed.

Table 1 Test pattern

1. **Pre-test**
- 8 exercises about axes and centres of symmetry (4 exercises consisting of two sub-exercises) - On IWB - video camera - same protocol
2. **Learning script**
- a learning sequence for five hours (based on a pattern with a precise methodology about axes and centres of symmetry (5 hours) - Using book « Actimath » (mathematics book) - Same methodological development in both experimental groups - video camera
3. **Post-test**
- 8 exercises about axes and centres of symmetry (4 exercises consisting of two sub-exercises) - On IWB - video camera - same protocol

Concerning the analysis of the process, all the social activity of students was encoded based on a video recording of the full lesson. Six indicators were considered: number of questions asked per student, number of answers given, number of remarks, number of interactions between the students in the class, number of interactions between a student in the class and a student at the IWB, and number of times each student raised their hand. The aim of this content analysis was to recognise these events for each student, irrespective of length, and then to record this information in a database.

5. DEPENDENT VARIABLES AND RESEARCH HYPOTHESES

The aim of this study is to analyse the impact of the independent variable, shared or restricted use, on three dependent variables: the perceptions, the processes and the performance (variables). Table 2 presents the distinction between these variables, the indicators associated with these variables and the different ways of collecting the data.

Table 2 Dependent variables, indicators and sources of the observation

Variables	Indicators	Sources of the observation
Perception- *Usability of the tool*	Learning Controllability Clarity Flexibility Skilfulness Usability	Adaptation and translation of the opinion survey of Davis (1989)
Usefulness of the tool	Helps to understand the material Helps to improve the quality of the work	Questionnaire concerning the usefulness of the tool
Motivation	Admitted motivation	Questionnaire on the motivation of the students
Process-	Average number of questions asked per student	Observations made in class

Social interactions of the students	Average number of answers given per student Average number of remarks made per student Average number of interactions between the students Average number of times hand raised per student Average number of interactions of the students with the person at the IWB	recorded with a video camera
Performance- *Progress of the students*	Scores in terms of relative gains per student	Analysis of the "pre-test" data Analysis of the "post-test" data

5.1. Hypothesis 1 – The usability and usefulness of the IWB gives the students a better grasp of the taught lesson and allows them to improve their learning

The first research hypothesis (H1) is about the perceptions of the learners according to two complementary dimensions. For this the learners had to be asked about the usability of the tool. Therefore, the translated version of Davis's survey was used (1989)[1]. Six criteria were selected in order to evaluate the usability of the tool: the Learning, the Controllability, the Clarity, the Flexibility, the Skilfulness, and the Usability. Each student had to choose an answer from a seven-point Likert scale (Strongly disagree – Disagree – Disagree somewhat – Undecided – Agree somewhat – Agree – Strongly agree). Learners were also asked about the usefulness of the tool for teaching/learning.

5.2. Hypothesis 2 – Sharing the use of the IWB gives more motivation to the students in comparison with an exclusive use of the tool by the teacher

All the students participating in the experiment were invited to evaluate several statements about their motivation level in order to confirm or invalidate this second hypothesis (H2).

5.3. Hypothesis 3 – Sharing the use of the IWB had an impact on the learning processes that were implemented during the learning sequence.

The variable called 'social interactions of the learners' was taken into account to test this third hypothesis (H3). The learning sequences were recorded and different indicators were selected to code all the interactions of the class (Bouchard & Mangenot, 2001) in order to observe the learning dynamic that had occurred during the courses. Based on the work of Sinclair & Coulthard (1992), each of the noted actions were classified into specific categories (questions asked by a student, answers given by a student, remarks by student, interactions between learners, times students raised their hands, open questions to the students, closed questions to the students, open questions to a student, closed questions to a student, given answers, remarks to the students and remarks to a student). Then, the video recordings and analyses made it possible to precisely encode the different interactions observed during the courses. In order to more easily compare the interactions between the groups, the results are presented in terms of average numbers.

5.4. Hypothesis 4 – Sharing the use of the IWB influences the homogeneity of the students in terms of performance.

The fourth research hypothesis (H4) is based on the theoretical model of Mayer (2010) according to which the quality of learning, including the use of technological material, increases as the student activity increases. The aim of the hypothesis is to find how an interaction method impacts on the progress made by the learners and to evaluate the homogeneity of the performance of the learners. The relative gains in their performance was calculated in order to assess the progress of the learners and to compare the performance of each group in the same way. These calculations were made using the formula described by D'Hainaut[2] (1975) which made it possible to have a comparison between the student's 'actual attainment' and what was calculated to be the 'best possible' attainment. So, the results of the 'pre-test' and 'post-test' meant that performance could be measured in terms of relative gains. These tests were carried out with all of the learners on an interactive support in order to evaluate them on a tool identical to that used for the lesson (Devauchelle, 2008). As previously mentioned, the analysis procedure of the performance, by means of 'pre-test' and 'post-test', consisted of an evaluation of four activities each made of two similar sub-exercises.

[1] The questionnaire, which was administered at the end of training, also included two items to assess the students' motivation in relation to their learning.

[2] The formula to calculate the relative gains is (Result post-test – Result pre-test) / (Maximum result – result pre-test) x 100.

6. ANALYSIS OF THE RESULTS

6.1. Analysis of the results concerning the usability and usefulness of the tool (H1)

Table 3 Descriptive statistics – Opinion of the learners according to the usability of the IWB (%)

Usability	Overall % of unfavourable opinions	Unfavourable opinions			Undecided	Favourable opinions			Overall % of favourable opinions
		Strongly disagree	Disagree	Disagree somewhat		Agree somewhat	Agree	Strongly agree	
Q 1 (Learning)	45.3	**22**	11	10.5	8.5	11	19.5	17.5	48
Q 2 (Controllability)	39	4	6.5	28.5	8.5	6	**40**	6.5	52.5
Q 3 (Clarity)	26	8.5	10.5	7	2	**31**	28	13	72
Q 4 (Flexibility)	40	18	5	17	11	10	**31**	8	49
Q 5 (Skilfulness)	31	4.5	9	17.5	6	20	18.5	**24.5**	63
Q 6 (Usability)	32.5	13	11	8.5	7	**26**	21.5	13	60.5

Table 3 highlights the differences of opinions in the groups that were used to carry out the experiment on the usability of the interactive whiteboard. In order to better understand the results, the overall percentages of unfavourable and favourable opinions are shown (Table 4). In this way, 68.5% of students from the group 'shared use of the IWB' answered the first question (Q1) favourably whereas 63.75% of the learners from the group 'exclusive use of the IWB' answered the same question unfavourably. For the question about the Controllability (Q2), 68.5% of students from the group 'shared use of the IWB' gave a positive response while 54.5% of the respondents from the other group gave a negative answer. While 73% of the learners from both groups agreed on a favourable answer to the third question (Q3) about Clarity. From the group which did not use the interactive tool during the learning sequences 54.5% answered the fourth question (Q4) about Flexibility favourably, with 44% of the learners from the other group expressing a favourable opinion about the same question. In answer to the fifth question (Q5) about Skilfulness, 80% of students from the group 'shared use' of the interactive whiteboard gave a favourable response and 54.5% of the learners from the group 'exclusive use of the IWB' gave an unfavourable answer to this question. With percentages under 50% for both favourable and unfavourable opinions, it appears that the students who could not use the tool during the course did not have a strong view about the sixth question (Q6). However, a large majority (76.5%) of the learners from the group 'shared use of the IWB' gave a favourable answer to this question.

The inferential analysis (Table 4) shows two significant differences between both groups (Q.1. M. – W. = 26.000; p. = **.021**; Q.5. M. – W. = 29.500; p. = **.038**). It must be noted that the students who made direct use of the tool gave a more positive opinion in terms of learning and skilfulness.

Table 4 Descriptive and inferential statistics – Opinion of the learners according to the usability of the IWB (%)

Usability		Unfavourable opinions			Undecided	Favourable opinions			M. – W.	p.
		Strongly disagree	Disagree	Disagree somewhat		Agree somewhat	Agree	Strongly agree		
Q. 1.	exclusive use of the IWB	**36.5**	18.25	9	9	18.25	0	9	26.000	**.021**
	shared use of the IWB	7.5	4	11.5	8.5	4	**38.5**	26		
Q. 2.	exclusive use of the IWB	0	9	**45.5**	9	0	36.5	0	33.500	**.070**
	shared use of the IWB	7.5	4	11.5	8.5	12	**43.5**	13		
Q. 3.	exclusive	9	9	9	0	**36.5**	27.5	9	57.000	.812

	use of the IWB									
	shared use of the IWB	8.5	12	4.5	4	25	**29**	17		
Q. 4.	exclusive use of the IWB	18.25	0	18.25	9	9	**36.5**	9	52.500	.591
	shared use of the IWB	17.5	10.5	15.5	12.5	11	**26**	7		
Q. 5.	exclusive use of the IWB	9	18	**27.5**	0	**27.5**	0	18	29.500	**.038**
	shared use of the IWB	0	0	7.5	12.5	12.5	**36.5**	31		
Q. 6.	exclusive use of the IWB	18.25	18.25	9	9	**36.5**	9	0	32.500	**.060**
	shared use of the IWB	7.5	4	7.5	4.5	15.5	**34.5**	26.5		

Concerning the usefulness of the interactive tool (Table 5), all the opinions of the students were favourable regardless the group. In fact, all the learners who did not use the tool gave a positive opinion and said that the interactive whiteboard helps to understand the academic content being taught. Moreover, when the percentages of favourable opinions are added together, the findings show that 92% of the learners from the group 'shared use of the IWB' agree with them. In the same way, it can be noted that 96% of the members from the group 'exclusive use of the IWB' gave a favourable answer to the proposition about improving the quality of work according to the use of the tool compared with more than 72% of students that used the tool during the learning sequence.

Table 5 Descriptive statistic – Opinion of the learners according to the usefulness of the IWB (%)

Usefulness		Groups	Unfavourable opinions			Undecided	Favourable opinions			Overall % of favourable opinions
			Strongly disagree	Disagree	Disagree somewhat		Agree somewhat	Agree	Strongly agree	
Item 1	Do you think that the IWB helps you to better understand academic content?	exclusive use of the IWB	0	0	0	0	18	**45.5**	36.5	100
		shared use of the IWB	0	0	4	4	12	39	**41**	92
Item 2	Using the IWB would improve the quality of your work.	exclusive use of the IWB	9	0	0	18.25	9	18.25	**45.5**	**72.75**
		shared use of the IWB	0	0	0	4	36.5	**38**	21.5	96

There is no significant difference of opinions among the groups (Item 1: M. – W. = 130.500; p. = .954; Item 2: Mann-Whitney[3] (M. – W.) = 131.000; p. = .970) concerning the inferential statistic. Having used the tool or not does not seem to influence the perceptions of the students as far as the usefulness of the tool is concerned. In fact, regardless of the way of using it, it appears that the interactive tool helps to have a better idea of the material and improves the quality of the work being done.

[3] Mann-Whitney is a non-parametric test to compare two independent samples of small size.

6.2. Analysis of the results on the motivation of the learners (H2)

Two items of the questionnaire, provided at the end of the educational sequence, were about the motivation of the learners (Table 6). The first item shows that sharing the use of the tool influences the level of motivation of the learners. So, while 73% of the members from the group 'exclusive use of the IWB' brought up the fact that their motivation did not change when the teacher used the interactive whiteboard on their own, 54% of the learners from the other group recognised that their motivation decreased significantly in the same situation (p=.018). The students who shared the use of the tool expressed that they felt that the situation was less relevant if the interactive whiteboard was used in a traditional way. For the second item, the views converge as far as the shared use of the interactive whiteboard between the learners and the teacher (p=.784) is concerned. In fact, the majority of the students in both groups said that their motivation for attending the course increased in such a teaching and learning context. For this item, 45% of learners from the group 'exclusive use of the IWB' said that their motivation decreased in such conditions while 25% of students from the group "shared use of the IWB" said that this did not influence their motivation.

Table 6 Descriptive and inferential statistics – Motivation of the learners

		Way of using	More motivated	Less motivated	It does not change your motivation	M. – W.	p.
Item 1	When your teacher teaches mathematics while using the interactive whiteboard on its own, you are…	Exclusive use of the IWB	9	18	73	70.500	**.018**
		Shared use of the IWB	21	54	25		
Item 2	When your teacher teaches mathematics while using the interactive whiteboard and you are invited to use it , you are…	Exclusive use of the IWB	54	45	0	125.500	.784
		Shared use of the IWB	71	4	25		

6.3 Analysis of the results about the learning processes (H3)

Figure 1 shows the average amount of social interaction, for a learner, according to both experimental groups. There are noticeable differences between the averages of both groups regarding the targeted social interactions. On the whole, the results are in favour of the group 'shared use of the IWB'. The group of learners that did not share the use of the tool got a higher average ($x= 37.27$; $\sigma = 25.09$) in comparison with the other group ($x= 36.21$; $\sigma = 24.83$) but for only one variable, the 'average number (x) of answers per student'. In other words, it appears that the group sharing the use of the interactive whiteboard exchanged and shared more information than the group that could not use the tool during the courses.

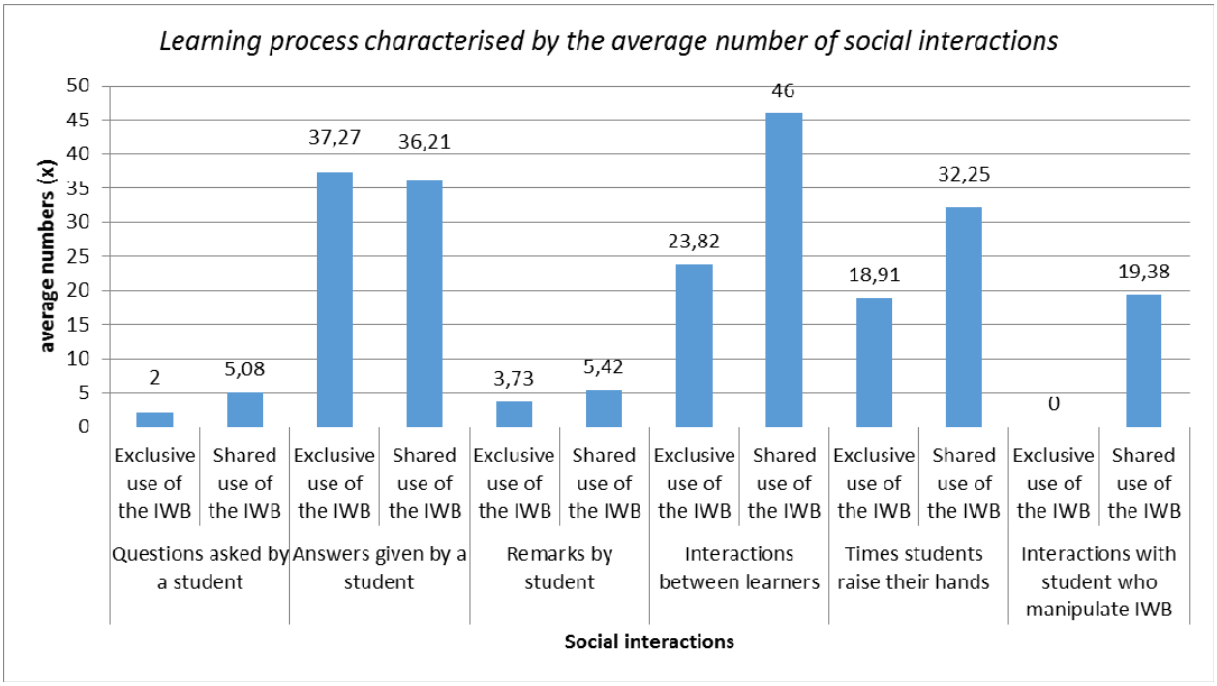


Figure 1 Descriptive statistics – learning process characterised by the average number of social interactions which were noted during the learning sequences

Thanks to the learning process analysis, it appears that the students who shared the use of the interactive whiteboard interacted more in comparison with students who could not use the tool directly. This statement has been statistically confirmed. There are indeed very significant differences in terms of average numbers (x) between both groups consisting of the targeted interaction types for the majority. Therefore, the students using the interactive tool asked the teacher more questions than the learners from the group 'exclusive use of the IWB' (t= -2.189; p. = .018). This result is an interesting indicator which suggests that students using the tool actively are more interested in, and motivated by, participating in the lesson. This statement is in line with the observations of other studies (Jeunier et al., 2005; Leroy, 2007) since they say that the use of the IWB by students increases their motivation and, therefore, their participation. Moreover, the learners who could share the use of the tool interacted more with each other than those for whom the use of the interactive whiteboard was limited to the teacher (t= -3,438 ; p. = .001). Thanks to the analysis of this learning process, therefore, it appears that the method which consists of sharing the use of the tool is an interesting lever to stimulate a learning activity based on the IWB. As noted in Cohen (2007) and Beauchamp & Parkinson, (2005), this study found that an educational mediation of the teacher between the whiteboard and the students encouraged collective work between the students and developed the contribution of others in the group. As well as the interactions between each other, students from the group 'shared use of the IWB' did not hesitate to help the learners using the tool and to interact with them (t= -5.272; p. = .000). The high significance of the difference between the groups, for this indicator, is due to the experimental plan and lies in the fact that only the students from the group 'shared use' had the possibility to develop these kind of interactions. The observations showed that the interactions mainly concerned the techniques for using the IWB to be able to cognitively perform the proposed exercises in the second phase.

6.4 Analysis of the results about the progress of the learners (H4)
From Table 7, a difference in the limit of the significance between the averages of both groups in terms of relative gains is observed.

Table 7 Descriptive and inferential statistics – Progression of the learners

modes of use of the IWB	**Pre-test**			**Post-test**			**relative gains**		
	average	CV		average	CV		average	CV	
exclusive use of the IWB	11.09	.43	t= -0.45 p = .482	15.82	.18	t= -1.69 p = .050	44.00	79.11	t= -1.60 p = .059
shared use of the IWB	11.17	.40		17.23	.11		61.88	46.26	

The learners sharing the use of the interactive whiteboard made more progress in the mastery of the skills up to 61.88% in comparison to the other group which was not allowed to use the tool and of which the average is 44.00%. If considering the dispersion of the results while observing the degrees of heterogeneity (CV) of the pre-test and post-test, there was a positive effect of the educational sequence on the homogeneity of the results whatever the way the IWB was used. If considering the difference between the modes of use, it is noted that the results of the learners for the post-test with the condition 'shared use' are more homogeneous (CV= .11) than those with the condition 'exclusive use' (CV= .18). In terms of intrinsic efficiency, a more participative educational management of the IWB leads to benefits both on the progress of the students and the level of heterogeneity of a group.

7. DISCUSSIONS, CONCLUSIONS AND PERSPECTIVES

The results achieved at the end of this study help to understand, to a certain extent, the lack of potential benefits from the contribution of the interactive whiteboard in recent meta-analyses (Karsenti, Collin & Dumouchel, 2012).

This study shows that a 'shared use' of the IWB has an impact on the learning and teaching process. The observations made in a similar context, in accordance with the premise 'all things being equal', gives the opportunity to see that sharing the use of the interactive whiteboard influences the quantity and types of favoured interactions. In this teaching situation, there were more social interactions in the classroom in comparison with an exclusive use of the board by the teacher. Furthermore, the teacher acted more individually when they shared the use of the tool with the students. This means that the teacher could observe the work of the students in real-time and had more possibilities to better regulate the learning process while advising the students and guiding them to perform the exercises. Several studies (Wood & Ashfield, 2008 ; Jeunier et al., 2005; BECTA, 2003) argue that the potential of the tool lays the groundwork for educational methods in greater accordance with the needs of the learners. However, it could be considered that the condition for an educational use of the tool, more than the tool itself, leads to a more differentiated teaching (Duroisin et al., 2011). The analysis of the declared level of motivation and the perceived usability corroborates this observation at the process level.

With regards to the educational efficiency of the mode of use of the IWB, the progress of the students is greater when they have the opportunity to share the use of the IWB and this can be explained by their greater commitment to the activity. Although this difference in terms of progress does not appear to be as significant on a statistical level, this analysis also shows a greater homogeneity of performance for those learners. It appears that sharing the use of the interactive tool considerably lightens the dispersion of the averages of all the learners from the group. This result is interesting insofar as it shows that different educational use of the IWB can have a positive effect on the level of heterogeneity of a group, which is often difficult for the teacher to achieve. Being exposed to content is therefore not enough to learn. It has to be backed up by a real thought in terms of tasks given to the students in order to facilitate the development of the targeted skills. This idea is perfectly coherent with the model of Mayer (2010) according to which the human factor is a key-variable to get a positive impact from the technology supporting learning if pertinent choices are made in terms of educational implementation.

At the end of this experiment and in light of the results presented, it can be considered that a well thought out, shared use of the interactive whiteboard has to be favoured if the learners participate actively and if the teacher is capable of mobilising the interactive potential of the tool. As this study has shown, giving the teacher exclusive of the tool has limited effects. However, as previously suggested, the perfect solution does not exist. The quality of the use of the tool and the given lesson essentially depends on the underlying thought process. Last but not

least, it should be noted that other dependent variables could also be taken into account. Additional measures which could be taken into consideration for further studies are things such as efficiency, the differences in the general performance and the precision between the productions made on paper or on an interactive whiteboard, the use of traces and the number of multimediatised resources used. This could help to better understand the learning dynamics around the interactive whiteboard. In terms of perspectives, it is important to further investigate the modes of participation of the students within a learning sequence including the use of the IWB. From the information available it seems that not many empirical investigations have evaluated interactivity on the whole, when the students have the opportunity to participate with the direct help of communication tools. These tools could be handheld voting devices or digital tablets which are equipped with specific software in order to manage the information flow between the teacher and the students.

8. ACKNOWLEDGEMENTS

Natacha Duroisin benefited from a F. R. S. - FNRS doctoral grant (Belgium). This work was supported by the F. R. S. - FNRS under Grant 5046941.

9. REFERENCES

Bams, M., Chevalier, M., Colin, M., Dewaele, P., Huin, F. Want, A. (2014). *Actimath*. Van In, Belgique.

Beauchamp, G. & Parkinson, J. (2005). Beyond the 'wow' Factor: Developing Interactivity with the Interactive Whiteboard. *School Science Review*, 86, 97-103.

Bidakia, M. Z. & Mobasheri, N. (2013). Teachers' Views of the Effects of the Interactive White Board (IWB) on Teaching. *Procedia - Social and Behavioral Sciences, Vol. 83*, p. 140–144.

Bouchard, R. & Mangenot, F. (2001). *Interactivité, interactions et multimédia*, ENS Editions, Lyon.

British Educational Communications and Technology Agency - BECTA (2005). What the Research Says about Interactive Whiteboards. http://web.archive.org/web/20061208064641/http://www.becta.org.uk/page_documents/research/wtrs_whiteboards.pdf Accessed 14 September 2013.

Cohen, Y. (2007). *Un tableau qui favorise et valorise les échanges*. *Médialog, 62*.

Dale, E. (1969). *Audiovisual Methods in Teaching*. A Holt-Dryden Book, New York.

Depover, Ch., Karsenti, Th. & Komis, V. (2007). *Enseigner avec les technologies : favoriser les apprentissages*. Presses Universitaire du Québec, Québec.

D'Hainaut, L. (1975). *Concepts et méthodes de la statistique*. Labor, Bruxelles.

Duroisin, N., Temperman, G. & De Lievre, B. (2011). Effets de deux modalités d'usage du tableau blanc interactif sur la dynamique d'apprentissage et la progression des apprenants, *EIAH*, Université de Mons, Mons.

Glover, D., & Miller, D. (2001). Running with Technology: The Pedagogic Impact of the Large-scale Introduction of Interactive Whiteboards in one Secondary School. *Journal of Information technology for Teacher Education*, 10, 257–276.

Glover, D., Miller, D., Averis, D., & Door, V. (2007). The evolution of an effective pedagogy for teachers using the interactive whiteboard in mathematics and modern languages: An empirical analysis from the secondary sector. *Learning, Media & Technology, 32*(1), 5–20.

Hennessy, S. (2013). Using the Interactive Whiteboards to Support Dialogue in the Whole Class Context. In Leask, M. & Pachler, N. *Learning to Teach Using ICT in the Secondary School. A Companion to School Experience.* Routledge.

Jeunier, B., Morcillo-Bareille, A. & Camps, J. F. (2005). *Expertise relative aux usages du tableau blanc interactif en école primaire*. Institut Universitaire de Formation des Maîtres. PrimTICE.

Karsenti, Th., Peraya, D. & Viens, J. (2002). Formation des enseignants à l'intégration pédagogique des TIC : Esquisse historique des fondements, des recherches et des pratiques, *Revue des sciences de l'éducation*, 28, 2.

Karsenti, T., Collin, S. & Dumouchel, G. (2012). L'envers du tableau : ce que disent les recherches de l'impact des TBI sur la réussite scolaire, *AQEP, 25* (2), p.30-32.

Kennewell, S & Beauchamp, G. (2007). Features of interactive whiteboards. *Learning, Media and Technology*, 32(3), p. 227-241.

Lee, M. (2010). Interactive Whiteboards and Schooling: the Context. *Technology, Pedagogy and Education, Volume 19*, Issue 2, p. 133-141.

Leroy, M. (2007). Du vidéoprojecteur au TBI ; Les TICE au service du collectif. *TICE Infos*, 21, Académie de Nancy-Metz.

Levy, P. (2002). *Interactive Whiteboards in Learning and teaching in two Sheffield schools: A developmental study*. Department of Information Studies, University of Sheffield. http://dis.shef.ac.uk/eirg/projects/wboards.htm. Accessed 19 novembre 2013

López, O. (2010). The Digital Learning Classroom: Improving English Language Learners' academic success in mathematics and reading using interactive whiteboard technology. *Computers & Education, Volume 54,* Issue 4, p. 901–915.

Macedo-Rouet, M. *Que dit la recherche?,* Agence des usages TICE, 2006. http://www.agence-usages-tice.education.fr/template.asp?page=10. Accessed 7 novembre 2013.

Mayer, R E. (2010), "Learning with technology", in Hanna Dumont, David Istance and Francisco Benavides (eds.), *The Nature of Learning: Using Research to Inspire Practice*, OECD Publishing.

Merrett, S. & Edwards, J. (2005). Enhancing mathematical thinking with an interactive whiteboard. *Micromath, 21*(3), 9–12.

Poyet, F. (2009). Impact des TIC dans l'enseignement : une alternative pour l'individualisation ?, Dossier d'actualité n° 41, Lyon : INRP.

Sinclair, J. & Coulthard, M. (1992). Toward an Analysis of Discourse. *Advances in Spoken Discourse Analysis*. Routledge, London.

Slay, H., Siebo¨rger, I. & Hodgkinson-Williams, C. (2008). Interactive whiteboards: Real beauty or just ''lipstick"? *Computers & Education, Vol. 51,* p. 1321–1341.

Somekh, B., Haldane, M., Jones, K. (2007). Evaluation of the Primary Schools Whiteboard Expansion Project. *Report to the Department for Children, Schools and Families*. Manchester Metropolitan University.

Torff, B., Tirottaa, R. (2009). Interactive whiteboards produce small gains in elementary students' self-reported motivation in mathematics. *Computers & Education, 54*, 379-383.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA : Harvard University Press.

Wall, K., Higgins, S. & Smith, H. (2005). 'The Visual Helps me Understand the Complicated Things': Pupil Views of Teaching and Learning With Interactive Whiteboards. *British Journal of Educational Technology*, 36 (5), 851-867.

Warren, C. (2002). Interactive Whiteboards: an approach to an effective methodology. http://www.virtuallearning.org.uk/whiteboards/An_approach_to_an_effective_methodology.pdfAccessed 5 janvier 2012.

Wood, R. & Ashfield, J. (2008). The Use of the Interactive Whiteboard for Creative Teaching and Learning in Literacy and Mathematics: a Case Study. *British Journal of Educational Technology*, 39 (1), 84-96.

Short Serious Games Creation under the Paradigm of Software Process and Competencies as Software Requirements. Case Study: Elementary Math Competencies

Arturo BARAJAS-S.
Computer Science Department, Universidad Autónoma de Aguascalientes, México
abarajas, fjalvar@correo.uaa.mx

Francisco J. ÁLVAREZ-R.
Computer Science Department, Universidad Autónoma de Aguascalientes, México

Ricardo MENDOZA-G.
Computer Science Department, Universidad Autónoma de Aguascalientes, México

Ana C. OVIEDO-DE-LUNA
Computer Science Department, Universidad Autónoma de Aguascalientes, México

ABSTRACT
Development of digital resources is difficult due to their particular complexity relying on pedagogical aspects. Another aspect is the lack of well-defined development processes, experiences documented, and standard methodologies to guide and organize game development. Added to this, there is no documented technique to ensure correct implementation of a competency in a videogame. This research proposes a Short Serious Game Development Process founded in Software Engineering paradigms and complemented by previous efforts on large scale development of digital learning resources. This paper focuses in a technique called Competency-Based Decomposition that achieves implementing a formal competency into a short serious game, with which the formal learning process will be complemented to improve the way students learn. Through a case study will be demonstrated its utility by implementing the process and the technique in the whole of mathematics competencies for sixth grade of elementary school in Mexico. The result of applying the proposed process for study case is a collection of video games that satisfactorily implements the competencies and its contents, its expected learning and its knowledge areas specified for sixth grade of elementary school in Mexico by the Ministry of Public Education.

INTRODUCTION
Through the experience gained by the different entities of software developers has identified the need to manage a software project for it to be successful.

To manage a project, four desirable characteristics of a software development team are identified (Reyes Delgado, 2005): the creation of a set of defined processes, the quality of products and, efficacy and efficiency efforts. To achieve the proper management of a software project should be performed, in the first instance, the creation of the defined processes of the organization through the use of best practices and formal software engineering methods and matured to match to the actual process of the organization.

Defined software development processes receive much attention in research, but are rarely used in industry for the development of software systems. One of the main reasons is that very little is known about the integration, interpretation, definition and adoption of software process and the precise role of processes in the lifecycle of software remains very diffuse (Plat & J. Toetenel, 1992).

Despite all the stresses generated in research centers, as mentioned in (Plat & J. Toetenel, 1992), globally there is a significant percentage of software development companies that do not use software processes for the development of projects. This problem can also be attributed to the fact that many entrepreneurs and software developers ignore the potential benefits of using software processes and their definitions for both quality of product and the quality of the process, and therefore the project (Chatzoglou, 1997).

When thinking about a large scale resource production you should think in a production that involves the creation of a set of software products through a development process based on standards, methodologies, process guidance and best practices of software engineering (Oktaba & Ibargüengoitia González, 1998). At this point, the Software Engineering provides a mechanism for the development of affordable software systems, and through organizations such as the SEI (Software Engineering Institute) and ISO (International Standardization Organization), have generated international standards for assurance of quality in software development processes and the management of resources and models to measure the maturity of software development processes, such

as CMMI (Capability maturity Model Integration), Rational Unified Process (RUP), Software process Improvement and Capability Determination (SPICE), Process Model for Software Industry (MoProSoft, internationally known as ISO 29100), Personal Software Process (PSP) and Team Software Process (TSP). (Sommerville, 2005) (Pressman, 2006) (Kulpa & Johnson, 2003)

But when talking about digital educational resources, "*A large scale development of digital learning resources involves the creation of a large number of these educational resources with a time limit, usually with the aim of supporting one or more educational courses.*" (Velázquez Amador et al., 2011)

PROBLEMS OF THE LARGE SCALE DEVELOPMENT

As mentioned in (Barajas Saavedra, Muñoz Arteaga, Álvarez Rodríguez, & García Gaona, 2009) and (Velázquez Amador, et al., 2011), a large scale development of digital learning resources involves the creation of a large number of these educational resources with a time limit, usually with the aim of supporting one or more educational courses.

Some of the reasons why it is not often the large scale development of digital resources are (Barajas Saavedra, Muñoz Arteaga, Álvarez Rodríguez, & García Gaona, 2009), (Velázquez Amador, et al., 2011), (Vidani & Chittaro, 2009), (Masuch & Rueger, 2005):

1. The difficulty of developing these resources, as they are resources with particular complexity by relying on pedagogical aspects.
2. Lack of well-defined development processes and experiences documented.
3. Lack of standard methodologies to guide and organize game development.
4. Game development in an educational environment have to face some severe restrictions in the development process compared to professional game development. This implies manpower, development time, and budget.
5. Lack of mechanism to guarantee the correct implementation of pedagogical aspects into the games, like for example a "Serious Game Requirements Management" or "Serious Game Quality Assurance".

However, despite the existing difficulties, in video games lies a viable means to solve the current problems of education, creating materials that support the knowledge acquired in the classroom, extending the classroom beyond the physical limits of the educational institution and allowing students to have an improvement in the way of learning through the use of these resources.

This research is providing solution to the lack of well-defined development processes for large scale production of serious video games, presenting a proposal for a development process with fundamentals in software engineering practices (Barajas Saavedra, Álvarez Rodríguez, Muñoz Arteaga, Santaolaya Delgado, & Collazos Ordóñez, 2014), the results of using this process for the production of various video games (Álvarez Rodríguez, Barajas Saavedra, & Muñoz Arteaga, 2014), and the results of usability testing of video games with students (Barajas Saavedra, Álvarez Rodríguez, Muñoz Arteaga, Santaolaya Delgado, & Collazos Ordóñez, 2014). Solving, in this way, the problems identified within this subject of investigation (Barajas Saavedra, 2009), that is to say: (1) the experts in contents have not been provided with simple and intuitive tools that automate the large scale production; (2) the game producers do not have the rationale that supports the structuring or design of the serious game, or the experience in the competencies in which the videogame applies; (3) for the production of a serious game neither a structured nor based on software engineering process exists that guarantees the consistency and standardization of the production to increase and to guarantee the quality of products.

This paper will present in detail the mechanism to guarantee that the pedagogical aspects (competencies, knowledge areas, contents and expected learning) are correctly implemented into the short serious games through a technique called **Competency-Based Decomposition**.

SHORT SERIOUS GAMES (SSG) DEVELOPMENT PROCESS

A Short Serious Game is a serious game that must have the following elements, regardless of their purpose (training, education, etc.) and its competencies:

1) **Pedagogic aspects**, which include the next elements:
   a) Learning needs of the individual or group of individuals.
   b) The social and cultural context of the individual or group of individuals.
   c) Learning methodology (includes consideration of the learning model and learning styles). This aspect covers the elements "Pedagogic considerations", "Learner specification" and "Context" proposed by

deFreitas and Oliver in (de Freitas & Jarvis, 2006) and (de Freitas & Oliver, 2006).

2) **Technical aspects** including:
   a) Considerations for game-play and story (Zyda, 2005).
   b) Level of fidelity, interactivity, immersion, fun, etc.
3) **Integration aspects** that include:
   a) Considerations for game-based learning (Martens, Diener, & Steffen, 2008).
   b) Considerations for inclusion of materials in formal classes.
   c) Considerations of context for the implementation of digital educational resources (de Freitas & Jarvis, 2006).

In **Figure 1** can be seen the SSG Development Process proposed by this research, which has the next features:

1. is founded in the traditional Software Engineering paradigms;
2. provides developers and game designers with a process that will lead them clearly through the production of an educational video game;
3. provides a framework for the integration of experts from different disciplines to develop an short serious game;
4. allows to implement the process in a transparent way because the game is considered as a software product;
5. provides, at the stage of requirements, the ability to develop products that tell teachers how to integrate the game with their classes.

Besides, this process enables SSG Developers to correctly manage SSG Requirements with Software Engineering best practices. Also, this process provides a new technique called Competency-Based Decomposition that transforms a competency and its components (contents, expected learnings, and knowledge areas) into a manageable and measureable software requirement so developers can successfully implement or develop at large scale those requirements (competencies) in the SSG.

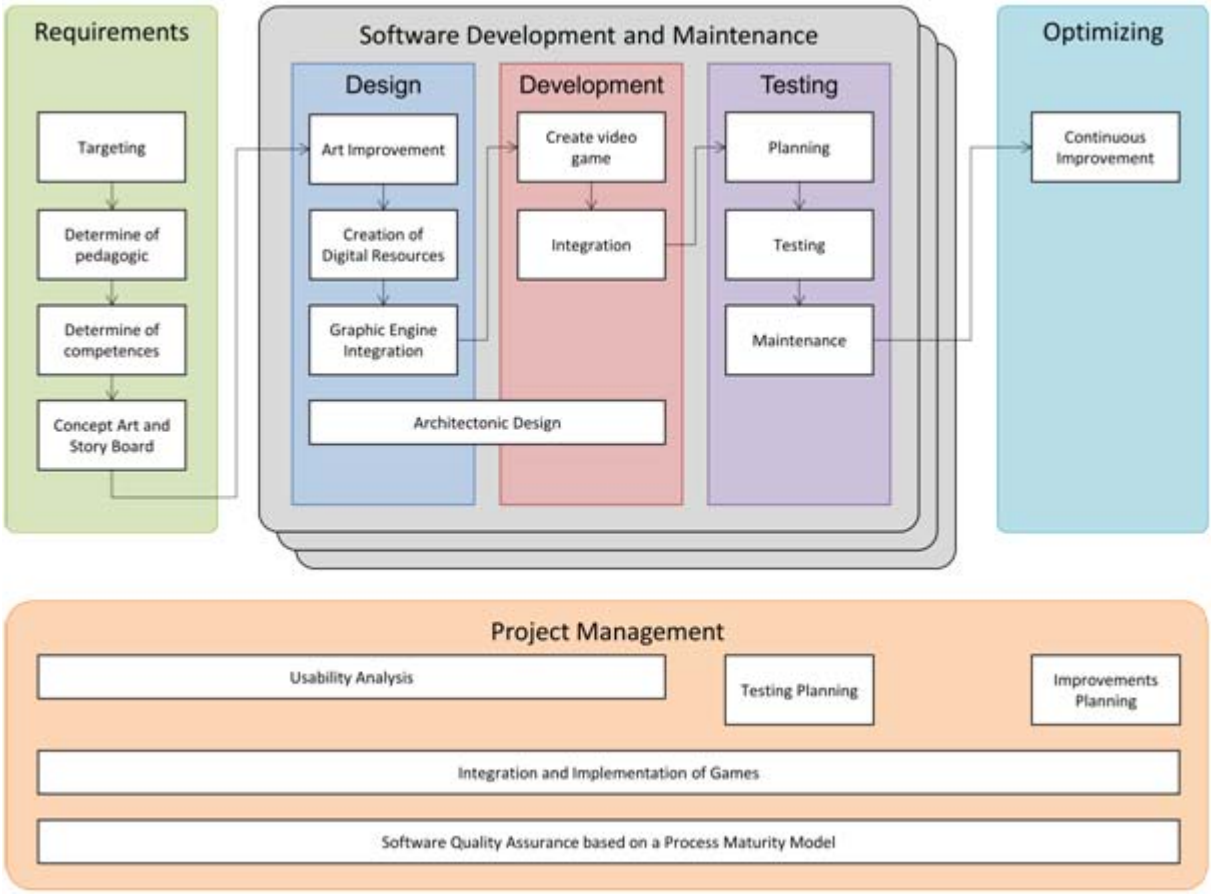


Figure 1. Short Serious Game Development Process.

Then, the fulfilment of the requirements must be ensured in order to guarantee product quality. The compliance

with requirements must be seen from the views: pedagogical, educational and ludic.

Next section presents a review of the quality aspects for digital educational resources and serious games, and presents a set of characteristics a short serious game must meet in order to have a good grade of quality.

QUALITY OF THE SHORT SERIOUS GAMES

In the particular case of educational resources studied in this research, (Velázquez Amador, et al., 2011) mentions that the quality of a digital educational resource covers various aspects of software development using an object-oriented paradigm, and issues related to pedagogy. Therefore, is identified the existence of technical and pedagogical aspects, and usability and content components, which are considered as aspects that determine the quality.

1. Technical aspects include reuse and adaptability, as well as those established by the software engineering as utility, reliability, among others.
2. Pedagogical aspects contemplate everything that facilitates the teaching-learning process, as we have examples, assessments, self-assessments, feedback, and a pedagogical objective expressed under any taxonomy, to mention some, Bloom's Taxonomy. The relationship between teaching methods and quality of the resource depends on the learning style of the user, so that John recommends that the modalities of digital resources include auditory, visual and kinesthetic recommendation that videogames cover perfectly.
3. In the content items are those that give information about the complexity of the subject and the level of detail that addresses the content.
4. The aspects of usability of a digital resource concern the presentation of information (fonts, colors, sizes, etc.) and the disposition thereof (symmetrically, asymmetrically, using positive and negative space, etc.). From the point of view of software engineering usability it means ease of use and learning of an object created by humans.

Bearing in mind the quality aspects for serious games, and the analyzed literature on video games and learning objects, a non-exhaustive set of basic features that represent a good starting point to achieve a usable product with a good grade of quality were identified:

1. Short and focused on a single knowledge area to guarantee portability of the video game. In case of a Game Scenario can implement all the knowledge areas of a competency through a set of mini-games or in a single game.
2. Graphical user interface with aesthetic and minimalist design, friendly, and pedagogically evaluated;
3. Cases with formal reasoning;
4. Cases randomly generated to prevent the student memorize the answers to problems;
5. Challenging content and generating competition among students using the game, i.e., cases with different levels of difficulty.

COMPETENCY-BASED DECOMPOSITION: A REQUIREMENTS IDENTIFICATION TECHNIQUE

This “Short Serious Game Requirements Management” was not found in the literature review done, so this paper will present a mechanism to match a formal competency with a non-formal content, identifying the aspects (contents and expected learnings) and factors that should be implemented in the production of the game so that satisfactorily cover the expectation of the competency within a scholar grade and guarantee the quality of the serious game through the fulfilment of the requirements. This process is called **Competency-based decomposition** (**CBD**), which is a proven successful way to accomplish the production of a digital educational resources that was applied for the development of the project “Business-Academia-Government Linkage Model for the Development of IT Capabilities of Human Resources” (Known in Spanish as “Modelo de Vinculación Empresa-Academia-Gobierno para el Desarrollo en Capacidades de Capital Humano en Tecnologías de la Información”) (Velázquez Amador, et al., 2011).

Before continuing, the definition (based upon the review of the work in (Mulder, Weigel, & Collins, 2007) and (Díaz Barriga, 2006)) used in this research for competency is as follows: “Competencies are all mental resources of individuals that are used to master tasks, acquire knowledge and achieve a good performance in some specified abilities with a certain skill level.”

With this procedure it is proposed to completely cover the contents and learnings that accompany a subject in a syllabus, thus ensuring the appropriation of knowledge and learning outcomes for a particular competency.

To perform the CBD is necessary to complete the following steps for each subject to analyze.

1. To identify the standards, goals and graduate profiles (SGGP) of the subject analyzed. This step is very important as the products of the subsequent steps must be aligned to these elements.
2. To identify the contents and expected learning of the syllabus.
3. To group, in knowledge areas, the contents and expected learnings in accordance with SGGP.
4. To organize knowledge areas in accordance with SGGP.
5. To identify competencies from the knowledge areas grouping.
6. To organize competencies and their knowledge areas in accordance with SGGP.

It is very important to stress that every competency and its knowledge areas must be attainable from the point of view of the Software Engineering, since, for example, the Study Program for Sixth Grade Mathematics published by the Ministry of Education, provides a set of math competencies, namely:

1. Solve problems independently.
2. Communicate mathematical information.
3. Validate procedures and results.
4. Efficiently handling techniques.

Where all of them are "Competencies for life", which, from the point of view of the Software Engineering, are very complex to manage and measure due to their multifactor nature.

In the next paragraphs is shown the application of this CBD process which was applied in this research to identify all the competencies for sixth grade mathematics to carry out the production of video games.

USING CBD TO IDENTIFY SOFTWARE REQUIREMENTS

This section will show the process to apply the CBD step by step using the Sixth grade math of Elementary school in México.

Step 1. To identify the standards, goals and graduate profiles.

In the next figures is shown the standards (**Figure 2**), goals (**Figure 3**) and graduate profiles (**Figure 4**) from the syllabus analyzed.

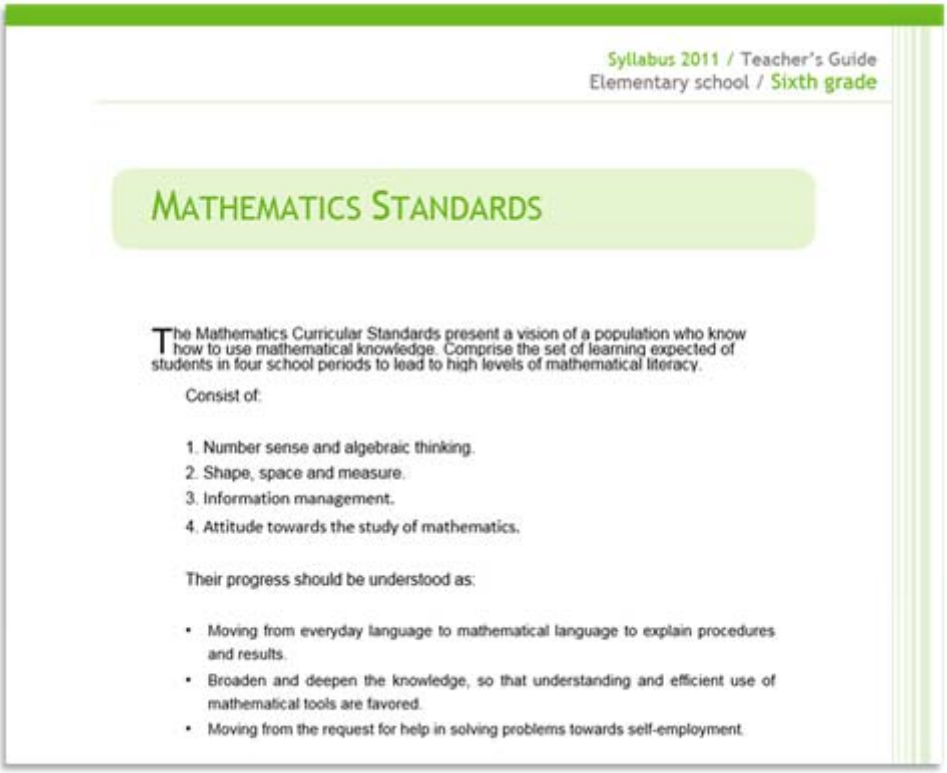
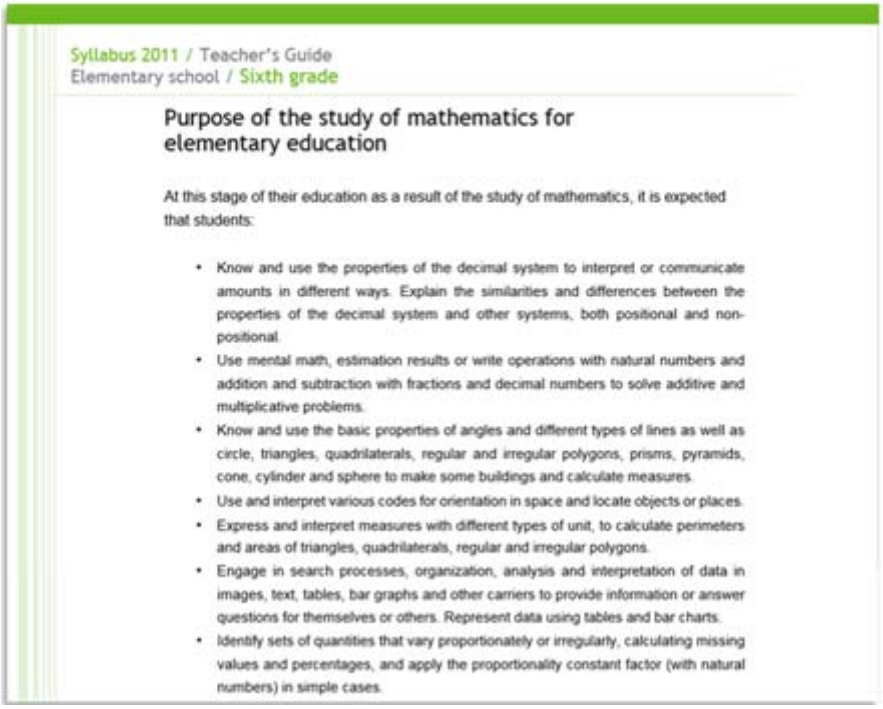


Figure 2. Standards of the study of mathematics for elementary education established in the Syllabus 2011 published by the Mexican Ministry of Education. (Secretaría de Educación Pública, 2011)

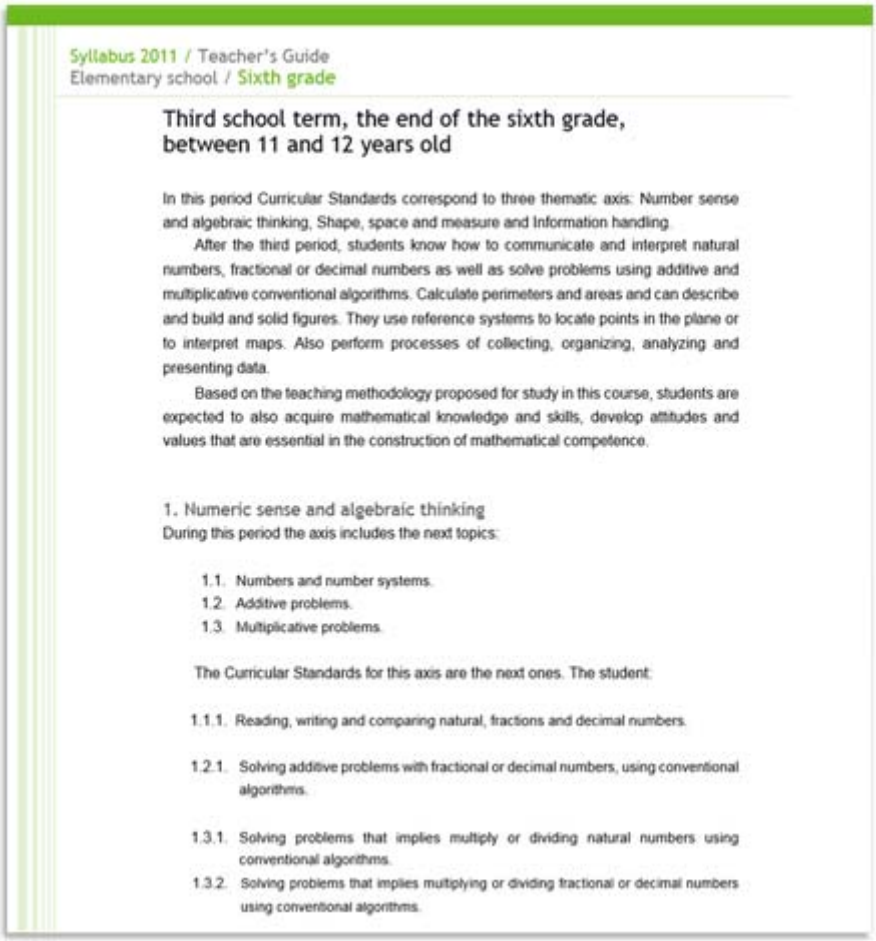

Syllabus 2011 / Teacher's Guide
Elementary school / Sixth grade

Purpose of the study of mathematics for elementary education

At this stage of their education as a result of the study of mathematics, it is expected that students:

- Know and use the properties of the decimal system to interpret or communicate amounts in different ways. Explain the similarities and differences between the properties of the decimal system and other systems, both positional and non-positional.
- Use mental math, estimation results or write operations with natural numbers and addition and subtraction with fractions and decimal numbers to solve additive and multiplicative problems.
- Know and use the basic properties of angles and different types of lines as well as circle, triangles, quadrilaterals, regular and irregular polygons, prisms, pyramids, cone, cylinder and sphere to make some buildings and calculate measures.
- Use and interpret various codes for orientation in space and locate objects or places.
- Express and interpret measures with different types of unit, to calculate perimeters and areas of triangles, quadrilaterals, regular and irregular polygons.
- Engage in search processes, organization, analysis and interpretation of data in images, text, tables, bar graphs and other carriers to provide information or answer questions for themselves or others. Represent data using tables and bar charts.
- Identify sets of quantities that vary proportionately or irregularly, calculating missing values and percentages, and apply the proportionality constant factor (with natural numbers) in simple cases.

Figure 3. Purposes or goals of the study of mathematics for elementary education established in the Syllabus 2011 published by the Mexican Ministry of Education. (Secretaría de Educación Pública, 2011)


Syllabus 2011 / Teacher's Guide
Elementary school / Sixth grade

Third school term, the end of the sixth grade, between 11 and 12 years old

In this period Curricular Standards correspond to three thematic axis: Number sense and algebraic thinking, Shape, space and measure and Information handling.

After the third period, students know how to communicate and interpret natural numbers, fractional or decimal numbers as well as solve problems using additive and multiplicative conventional algorithms. Calculate perimeters and areas and can describe and build and solid figures. They use reference systems to locate points in the plane or to interpret maps. Also perform processes of collecting, organizing, analyzing and presenting data.

Based on the teaching methodology proposed for study in this course, students are expected to also acquire mathematical knowledge and skills, develop attitudes and values that are essential in the construction of mathematical competence.

1. Numeric sense and algebraic thinking

During this period the axis includes the next topics:

1.1. Numbers and number systems.
1.2. Additive problems.
1.3. Multiplicative problems.

The Curricular Standards for this axis are the next ones. The student:

1.1.1. Reading, writing and comparing natural, fractions and decimal numbers.

1.2.1. Solving additive problems with fractional or decimal numbers, using conventional algorithms.

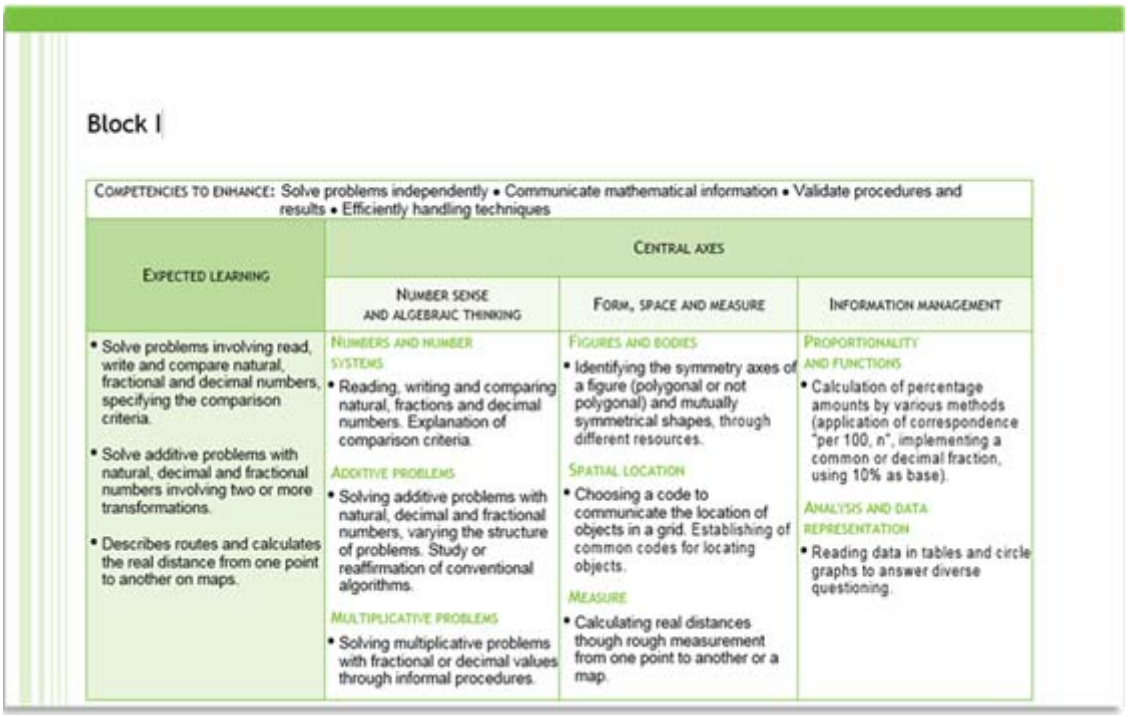
1.3.1. Solving problems that implies multiply or dividing natural numbers using conventional algorithms.

1.3.2. Solving problems that implies multiplying or dividing fractional or decimal numbers using conventional algorithms.

Figure 4. Graduate profile of mathematics for elementary education established in the Syllabus 2011 published by the Mexican Ministry of Education. (Secretaría de Educación Pública, 2011).

Step 2. To identify the contents and expected learning of the syllabus.
In the Syllabus 2011 can be found all the subjects that integrate a scholar grade, and each grade is divided into blocks.

Each block is integrated in its first level by the central axis, in its second level by the topics, and in its third level by the contents. This can be seen in **Figure 5**. As you can see there are only three axes in the figure, this is due to that the fourth axis "Attitude towards the study of mathematics" is implicitly evaluated by the other three axes.



Block I

COMPETENCIES TO ENHANCE: Solve problems independently • Communicate mathematical information • Validate procedures and results • Efficiently handling techniques

EXPECTED LEARNING	CENTRAL AXES		
	NUMBER SENSE AND ALGEBRAIC THINKING	FORM, SPACE AND MEASURE	INFORMATION MANAGEMENT
• Solve problems involving read, write and compare natural, fractional and decimal numbers, specifying the comparison criteria. • Solve additive problems with natural, decimal and fractional numbers involving two or more transformations. • Describes routes and calculates the real distance from one point to another on maps.	NUMBERS AND NUMBER SYSTEMS • Reading, writing and comparing natural, fractions and decimal numbers. Explanation of comparison criteria. ADDITIVE PROBLEMS • Solving additive problems with natural, decimal and fractional numbers, varying the structure of problems. Study or reaffirmation of conventional algorithms. MULTIPLICATIVE PROBLEMS • Solving multiplicative problems with fractional or decimal values through informal procedures.	FIGURES AND BODIES • Identifying the symmetry axes of a figure (polygonal or not polygonal) and mutually symmetrical shapes, through different resources. SPATIAL LOCATION • Choosing a code to communicate the location of objects in a grid. Establishing of common codes for locating objects. MEASURE • Calculating real distances though rough measurement from one point to another or a map.	PROPORTIONALITY AND FUNCTIONS • Calculation of percentage amounts by various methods (application of correspondence "per 100, n", implementing a common or decimal fraction, using 10% as base). ANALYSIS AND DATA REPRESENTATION • Reading data in tables and circle graphs to answer diverse questioning.

Figure 5. Extract of the syllabus for sixth grade math of elementary school. This figure shows the competencies to enhance, the expected learning, the central axes, the topics and the contents for the Block I. The syllabus is integrated by five blocks. Note that the fourth axis is not shown due to is evaluated implicitly in the other three. (Secretaría de Educación Pública, 2011)

Step 3. To group, in knowledge areas, the contents and expected learnings.
After identifying the contents and expected learning, the grouping resulted in the next knowledge areas:

1. Areas
2. Cartesian plane
3. Combinations
4. Cross product
5. Decimal system
6. Fractions
7. Graphic representation of results
8. Handling of solid figures
9. Lengths
10. Odds
11. Operations
12. Patterns
13. Percentages
14. Perimeters
15. Shapes and polygons
16. Time
17. Values of unity
18. Volume
19. Weight/Mass

Step 4. To organize knowledge areas.
The process of organizing the knowledge areas resulted in the creation of "groups" that later will be competencies.

1. Competency 1
   a. Operations
   b. Decimal system
   c. Fractions
2. Competency 2
   a. Shapes and polygons
   b. Handling of solid figures
   c. Cartesian plane
3. Competency 3
   a. Lengths
   b. Volume
   c. Weight/Mass
   d. Perimeters
   e. Areas
   f. Time
4. Competency 4

a. Graphic representation of results
5. Competency 5
   a. Patterns
   b. Values of unity
   c. Cross product
   d. Percentages
6. Competency 9
   a. Combinations
   b. Odds

Step 5. To identify competencies from the knowledge areas.
The identified competencies are:

1. The numbers, relationships and operations
2. Geometry
3. Measures and Conversions
4. Information processing
5. Processes of change
6. The prediction and chance

Step 6. To organize competencies and their knowledge areas.
The Competency-Based Decomposition process is graphically shown in the following figure (see **Figure 6**). The final result of this process, is shown in **Figure 7**.

Figure 6. This approach allows to match a formal competency with a non-formal content, identifying the aspects and factors that should be implemented in the production of the game so that satisfactorily cover the expectation of the competency within a scholar grade.

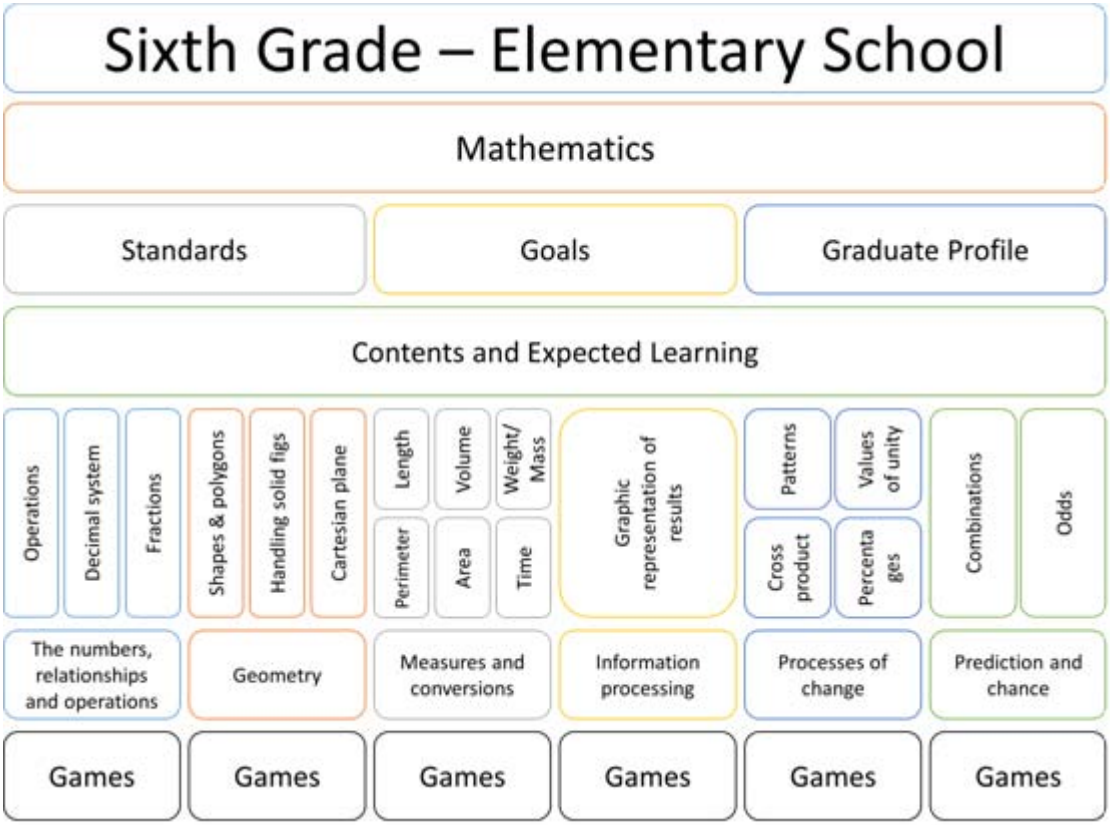


Figure 7. Result of the Competency-Based Decomposition applied to the subject Mathematics of sixth grade of elementary school.

CASE STUDY: SIXTH GRADE VIDEO GAMES

As a proof of concept of our approach the research conducted a case study using as scenario "the development of educational games to cover all the official competencies for sixth grade for elementary school in Mexico". Competencies shown in **Figure 7** lead us to create a collection of fifty educational videogames oriented to increase learning encouraging appropriation of specific math-competencies. A summary of this list is presented in **Table 1**.

Table 1. Extract of developed video games.

Video games	***Knowledge areas***	***Language***
pokeMath	Operations	JavaME
MathChallenge	Operations	.NET
	Weight/mass	.NET
DS3A	Operations	JavaME
SpaceMath	Operations	Flash
Fracciones	Fractions	JavaME
GeoBodies	Shapes and polygons	JavaME
CubeLand	Handling of solid figures	OpenGL
Submarino	Cartesian plane	JavaME
GolfMeter	Lengths	JavaME
miHuerta	Volume	JavaME
Áreas	Areas	JavaME
Ubicación	Values of unity	JavaME
Regla de Tres	Cross product	JavaME
Kaxan	Percentages	JavaME
WWE	Odds	JavaME
Marcianos	Shapes and polygons	Android
Time Rider	Time	JavaME/Android
Time Champ	Time	JavaME/Android
Jinete Solitario	Lengths	JavaME/Android

Perimeters	Perimeters	JavaME/Android
Softy	Combinations	JavaME/Android
MathFractions	Fractions	JavaME/Android

TESTING THE VIDEO GAMES

After the initial production phase of educational video games, the team proceeded to test them in order to study the impact on the learning level of students exposed to this learning strategy. Participants consisted in a group of 29 students from sixth grade of elementary school from the "Federal Rural Cuauhtémoc Elementary School" located in La Paz, Ojuelos, Jalisco. Children studying in this school come from families just as scarce resources. This community has many needs, and to increase the use of IT access to information technology helps to alleviate some of them.

The process performed for the test was as follows(Hernández Sampieri, Fernández Collado, & Baptista Lucio, 2010): (1) Identify potential schools. (2) Tests were designed for initial and control evaluations. The tests were designed to evaluate knowledge level of students in the next knowledge areas: Areas, Handling of solid figures, Fractions, Shapes and polygons, and Crossed product. (3) School was selected. (4) Students group was selected. The group was divided into two parts; taking into account that in both groups, students' average grade must be equally distributed, i.e., the group was divided according to the average grades of the students. (5) Initial evaluation was applied to all students. (6) The test group used video games in one-hour sessions twice a week for four weeks. (7) At the end of eight sessions, a control test was applied to identify the impact of video games use. (8) The collected data were analyzed with SPSS software.

RESULTS OF KNOWLEDGE EVALUATION

The team applied linear regression to the results obtained during testing for each knowledge area. The information allow to determine trends in student's scores before and after use short serious games. The overall findings are graphically depicted in **Figure 8** where diamonds-line displays the results obtained during initial examination. Squares-line displays the results of the evaluation performed after short serious games use.

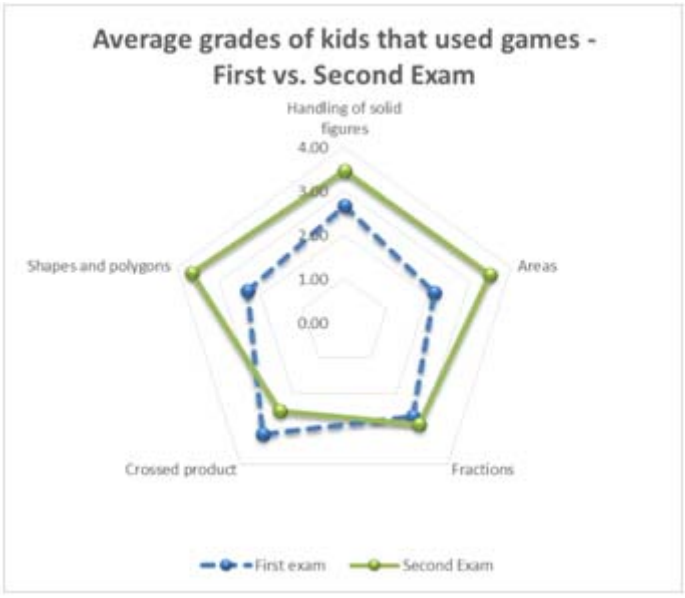


Figure 8. Overall result of the students in different areas of knowledge tested.

As the reader can see, there are improvements in four knowledge areas, this is due to the students achieved a higher level of adoption of the competencies implemented in the short serious games they used.

The "Crossed Product" game, which shows a decrease in the adoption of the competency, was developed with a question bank instead of randomly-generated problems, so the students memorized suck question bank and did not achieve the intended adoption of the competency.

DISCUSSION

The correct implementation of the competencies and the characteristics of the short serious games is extremely important because this is the only way to guarantee that the students of users will achieve a higher level of adoption of the competencies implemented in the games.

As the reader can see, the "Crossed Product" game did not achieve its purpose: transfer the competency into the students due to a deviation in its development.

CONCLUSIONS AND FUTURES WORK

This research proposes a short serious game development process that includes an explicit requirements management which allows the identification and modeling of the software requiremets from a set of implicit educative competencies of an official syllabus.

This process makes available to research or (independent) development groups, universities and companies a clear guide to the development of a short serious game. It also eases the implementation of the process itself because it has a documental support that guides the team through the development of the products. This process also allows managing the product quality through checkpoints in the provided documentation, achieving in this way develop a high quality product with a high level of fulfilment of the competencies (requirements).

The CBD process allows clearly identify the competencies to implement in the short serious games, since in many cases this aspect is not taken into account during the development process (if a development process exists). The CBD process takes as inputs common elements in the syllabus and turns them into short serious game programmable and measurable competencies (requirements).

Once identified the competencies, the short serious game development process is capable of building software products, from those requirements (which include learning activities and learning contents), with a high quality level and meeting the correct implementation of the competencies.

This research has created and tested (with real world students) a big set of short serious games, achieving an improvement in the competency adoption due to the correct implementation of requirements (competencies, learning activities and learning contents) into the games.

The short serious game process is being translated into SPEM and ISPW-6 with a variability model and will be published online once it is finished. In this way it will be turned into a Serious Game Development Framework that will be accessible to anyone interested in developing short serious games.

REFERENCES

Álvarez Rodríguez, F., Barajas Saavedra, A., & Muñoz Arteaga, J. (2014, May 16). Serious Game Design Process, Study Case: Sixth Grade Math. Creative Education, 05(09), 647-656. doi:doi:10.4236/ce.2014.59077

Barajas Saavedra, A., Álvarez Rodríguez, F., Muñoz Arteaga, J., Santaolaya Delgado, R., & Collazos Ordóñez, C. (2014). A serious games development process using competency approach. Case Study: Elementary School Math. In A. I.-O. (AIPO) (Ed.), XV International Conference on Human Computer Interaction (pp. 572-579). Puerto de la Cruz, Tenerife, España: AIPO. Retrieved September 30, 2014

Barajas Saavedra, A., Muñoz Arteaga, J., Álvarez Rodríguez, F., & García Gaona, M. (2009). Developing Large Scale Learning Objects for Software Engineering Process Model. 2009 Mexican International Conference on Computer Science, 203-208. doi:DOI 10.1109/ENC.2009.46

Chatzoglou, P. D. (1997). Use of Methodologies: an Empirical Analysis of their Impact on the Economics of the Development Process. European Journal of Information Systems, 6, 256-270.

de Freitas, S., & Jarvis, S. (2006). A framework for developing serious games to meet learner needs. I/ITSEC '06: Proceedings of the International Conference on Interservice/Industry Training, Simulation and Education.

de Freitas, S., & Oliver, M. (2006). How can exploratory learning with games and simulations within the curriculum be most effectively evaluated? Computers & education, 46(3), 249-264.

Díaz Barriga, Á. (2006). El enfoque de compentecias en la educación. ¿Una alternativa o un disfraz de cambio? Revista Perfiles Educativos(111), 7-36. Retrieved September 2013, from http://www.iisue.unam.mx/perfiles/perfiles_articulo.php?clave=2006-111-7-36&url=2006/n111a2006/mx.peredu.2006.n111.p7-36.pdf

Kulpa, M. K., & Johnson, K. A. (2003). Interpreting the CMMI: A Process Improvement Approach. Boca Raton, Florida, Estados Unidos: Auerbach Publications CRC Press LLC.

Martens, A., Diener, H., & Steffen, M. (2008). Game-based Learning with Computers - Learning, Simulations, and Games. Transactions on Edutainment, 172-190.

Masuch, M., & Rueger, M. (2005, January 28-29). Challenges in collaborative game design developing learning environments for creating games. Third International Conference on Creating, Connecting and

Collaborating through Computing, 67-74. doi:10.1109/C5.2005.7
Mulder, M., Weigel, T., & Collins, K. (2007, March). The concept of competence in the development of vocational education and training in selected EU member states: a critical analysis. Journal of Vocational Education & Training, 59(1), 67-88. doi:10.1080/13636820601145630
Oktaba, H., & Ibargüengoitia González, G. (1998). Software Process Modeled with Objects: Static View. Computación y Sistemas, 1(4).
Plat, N. v., & J. Toetenel, H. (Septiembre de 1992). Application and benefits of formal methods in software development. Software Engineering Journal, 7(5), 335-346.
Pressman, R. S. (2006). Software engineering: a practitioner's approach (Sexta ed.). McGraw-Hill.
Reyes Delgado, P. Y. (2005). Tesis de Maestría Diseño de un Instrumento de Auto-evaluación para Diagnosticar el Estatus de las Organizaciones en México con Respecto al Modelo ProSoft: Proceso de Gestión de Procesos de la Categoría de Gestión. México.
Secretaría de Educación Pública. (2011). Programas de estudio 2011 - Guía para el maestro - Educación básica - Primaria - Sexto grado (First Electronic Edition ed.). Cuauhtémoc, México, D.F., México: Gobierno Federal SEP. Retrieved September 15, 2014, from http://www.curriculobasica.sep.gob.mx/images/PDF/prog_primaria/PRIM_6to2011.pdf
Sommerville, I. (2005). Software enginnering (Septima ed.). Pearson Education.
Velázquez Amador, C. E., Álvarez Rodríguez, F. J., Garza González, L., Sicilia, M. Á., Mora Tavarez, J. M., & Muñoz Arteaga, J. (2011, Noviembre). Una Experiencias en el Desarrollo Masivo de Objetos de Aprendizaje Empleando Parámetros de Calidad y un Proceso de Gestión Bien Definido. IEEE - Revista Iberoamericana de Tecnologías del Aprendizaje, 6(4), 155-163.
Vidani, A. C., & Chittaro, L. (2009, March 23-24). Using a Task Modeling Formalism in the Design of Serious Games for Emergency Medical Procedures. 2009. VS-GAMES '09. Conference in Games and Virtual Worlds for Serious Applications, 95-102. doi:10.1109/VS-GAMES.2009.24
Zyda, M. (2005, September). From visual simulation to virtual reality to games. Computer, 38(9), 25-32. doi:10.1109/MC.2005.297

Students' Perceptions of Edmodo and Mobile Learning and their Real Barriers towards them

Khaleel M. Al-Said
Department of Educational Technology, College of Education - Taibah University - KSA
khaleelalsaid@hotmail.com

ABSTRACT
The present research aims to investigate the students' perceptions levels of Edmodo and Mobile learning and to identify the real barriers of them at Taibah University in KSA. After implemented Edmodo application as an M-learning platform, two scales were applied on the research sample, the first scale consisted of 36 statements was constructed to measure students' perceptions towards Edmodo and M-learning, and the second scale consisted of 17 items was constructed to determine the barriers of Edmodo and M-learning. The scales were distributed on 27 students during the second semester of the academic year 2013/2014. Findings indicated that students' perceptions of Edmodo and Mobile learning is in “High” level in general, and majority of students have positive perceptions towards Edmodo and Mobile learning since they think that learning using Edmodo facilitates and increases effectiveness communication of learning, and they appreciate Edmodo because it save time. Regarding the barriers of Edmodo and Mobile learning that facing several students seem like normal range, however, they were facing a problem of low mobile battery, and storing large files in their mobile phones, but they do not face any difficulty to enter the information on small screen size of mobile devices. Finally, it is suggested adding a section for M-learning in the universities to start application of M-learning and prepare a visible and audible guide for using of M-learning in teaching and learning.

Keywords: Edmodo, Edmodo perceptions, Edmodo Barriers, Mobile learning perceptions, Barriers of M-learning.

INTRODUCTION
The rapid and continual development in information and communications technologies (ICT), including improved wireless networking, and use mobile devices between university students' created a new learning environment, called "Mobile learning” or "M-learning". Mobile phone was just a tool to communicate with others by voice, but it is fast changed to multi-purpose tool in the light of the wireless technology like personal computer with high-quality camera functions, however, most mobile phones had become small and light weight, providing SMS and MMS, clock, stopwatch, calendar, games, multimedia player, and enabled to browse the Internet to send and receive e-mails or to share multimedia experience as the text, audio and images in addition to voice calls (Hartnell-Young and Heym, 2008). The hand-held mobility of the mobile phone make it growing at fast rate and make the number of it in many countries outnumber their population like in Saudi Arabia, for each 100 Saudi citizen they have180 mobile phones (Riyadh Newspaper, 2012). In addition, the increasing of adoption and acceptance of M-learning in all countries are not the same due to availability of infrastructure of mobile technology, the level of awareness of M-learning, and the expertise in the field of M-learning, and the willingness of the students to implement and use M-learning (Osang, et al., 2013).

Unlike more traditional environments of learning, M-learning is a recent e-learning environment, it has been introduced as a new learning technology lead to new learning form, through the availability of use mobile devices, such as smart phones, PDAs, and handheld computers by anyone to access information and learning materials from anywhere and at any time. However, M-learning allows students to learn from which location they want to learn since they can learn whenever and wherever they want on their existing mobile devices. Simply, the flexibility of use mobile devices at all times in the day and the night is it the most important characteristics of M-learning to achieve the idea of learning at anytime and anywhere (Pisey, et al., 2012).

Using of portable mobile devices in teaching, learning, and training provide the learners and trainees the ability to access the learning materials continuously, anytime anywhere, and at the same time, provide the teachers and trainers the ability to easily deliver homework activities continuously without interruption for learners and trainees, and that are parts of the educational process, which may not be provided by e-learning. M-learning and Edmodo application can take place everywhere, every time at home, in a car, day, night, etc. since mobile device are lighter and less bulky from bags full of books, papers, or even laptops. Despite the benefits and advantages of M-learning are countless, but unfortunately, there are some challenges and barriers appear in implementation of such learning form (Chanchary and Islam, 2009, Jarc, 2010, and Addison, 2011).

STATEMENT OF THE RESEARCH PROBLEM

In the twenty-first-century, especially in the last decade, many international conferences related to M-learning were held in different countries (Sweden, UK, Italy, Australia, South Africa, Canada, USA, Malta, etc.) to promote the use of wireless mobile technology in learning, for example, in Sweden 2002 held "mLearn" it was the first annual international conference and workshop on mobile and wireless techniques in education, also in Canada and in Greece in 2006 were held other two M-learning conferences. In February and October 2009 in the USA were held another two conferences, and at the same year 2009 in Spain (Barcelona) was held one more to present some projects and experimentations in the field of M-learning. In Malta (2010) was held the 9th World Conference on Mobile Learning (9th mLearn), then the tenth annual conference mLearn was held in China (2011), and before two years ago in 2012 were held two conferences, one in Finland (Helsinki) was held the 11th mLearn conference, and the second one was held in Jordan (Amman) the international conference to promote the use of mobile technology in interactive teaching and learning, and finally, the last World Conference on Mobile and Contextual Learning (12th mLearn) was held in Qatar in 2013.

These days, mobile devices integrated into students' lives since the majority of them use mobile devices such as smartphones, phaplets, tablets pc, iPads, e-book readers, however, reports by International Telecommunication Union (ITU) showed that the number of mobile phone users around the world will exceed the actual population of the globe by 2015, and the number of subscribers to mobile phone service that will reach 9 billion subscriber of 6 billion subscriber currently. Moreover, reports of ITU also pointed to the high number of mobile subscribers in Saudi Arabia to 54.5 million subscribers in 2012, and that number is increasing nowadays (Riyadh Newspaper, 2012).

In addition, many recent publications and research projects related to mobile learning were present the prospects and benefits of M-learning environments like (Kukulska-Hulme and Traxler, 2005, Mehdipour and Zerehkafi, 2013), and other several of studies identified teachers' perceptions or students attitudes of M-learning like (Jacob and Issac, 2007, Al-Fahad, 2009, Khwaileh and AlJarrah, 2010, Hung, et al., 2010, Alzaidiyeen, et al., 2011, Uzunboylu and Ozdamli, 2011, Serin, 2012), and also, other several of studies reviewed the opportunities, and challenges in their countries, like (Hartnell-Young and Heym, 2008, Paliwal, and Sharma 2009, Vavoula and Sharples, 2009, Saleem, 2011, Pisey, et al., 2012, and Osang, et al., 2013). Some of these studies confirmed the existence of challenges and barriers, and they indicated limitations or obstacles in implementation of M-learning in their countries such as (Perry, 2003, Facer, et al., 2005, Krämer, 2005, Chanchary and Islam, 2009, and Addison, 2011). Although most of the studies are related to the mobile learning the studies on the perceptions of the students towards mobile learning and barriers at the same time are quite few or no research has been carried out to determine students' perceptions level of Edmodo and M-learning and to identify the barriers of them at the same time especially in the developing countries like KSA, because maybe most of them are still in the first level of readiness or maybe in the development level in implementing this type of learning environment and using Edmodo. Therefore, this research will attempt to investigate the perceptions' levels and barriers facing the students in Edmodo and M-learning through using their mobile devices to achieve learning objectives since it has not so far been studied in KSA.

Finally, the importance of this research is that by determining whether the students have positive perceptions of Edmodo and M-learning and whether there are deficiencies in the use of Edmodo and M-learning. Also, it is thought that the identifying of barriers of Edmodo and M-learning will contribute to the field of mobile technologies since it could be the first step in the right way to overcome them and to improve the M-learning process as a new form of learning by involving it in the coming years as learning form at university level.

AIMS OF RESEARCH

The present research aims to investigate the students' perceptions levels of Edmodo and Mobile learning and to identify the real barriers of Edmodo and M-learning that facing the students at Taibah University in KSA. For this aims of the research, it is supposed to answer the following two questions:
What is the perception level of the students towards Edmodo and M-learning at Taibah University?
What are the real barriers facing the students in Edmodo and M-learning at Taibah University?

TERMS OF THE RESEARCH AND ITS LIMITATIONS

Edmodo: is a simple M-learning tool using to present the lesson contents, it is common to all operation systems of smartphones; it provides useful tools for students and teachers to interact online outside class anywhere, anytime (Hourdequin, 2014).

M-learning: it is new learning form include using mobile phones, smartphones, personal digital assistants (PDAs) and tablet PCs, netbooks (ultra-mobile laptop PCs), personal digital multimedia players, portable gaming

consoles, but not desktops (Traxler, 2005) and (O'Connell, and Smith, 2007). The operational definition of M-learning: Learning with smart phones using Edmodo application based on a mobile learning service.

Perception: the tendency of the individual behavior about the variables that require acceptance or rejection response towards different subjects, or it is psychological state when an individual character that carries a positive or negative towards something (Oxford dictionary, 2014). The operational definition of the Perception: it is the degree of responses of the study sample on a perception scale of Edmodo and M-learning, and be positive, negative or neutral.

Barriers: something that obstructs or impedes to understanding, or anything that obstructs progress, access, etc. (The Free dictionary, 2014). The operational definition of the barriers it is the factors or variables that limits learn and understand of the study sample using their mobile devices to learn.

The present study is confined to the male students of Taibah University, and course of Teaching Means (two chapters), during the second semester of the academic year 2013-2014 AD.

THEORETICAL FRAMEWORK

Nowadays, mobile devices such as cellular phones, smartphones, tablet PCs, and netbooks (ultra-mobile laptop PCs) are recognized as essential tools for our daily lives, at the same time these devices are the main tools for M-learning. In fact, term of M-learning has risen in educational field to express learning using these portable mobile devices, however, M-learning is one of the e-learning system depends on wireless information communication technology and based on mobile devices in teaching, learning, training, and management homework of learners, it allows them to access educational materials at anytime, anywhere, outside the teaching hall, it is not only an extension for distance learning, but is also a part of the e-learning and the future of it (Ally, et al., 2005). Paul Williams (2008) depicts D-Learning as the foundation for E-Learning and E-Learning as the foundation for M-Learning and he demonstrates the relationship between M-learning, e-learning, distance learning and face to face learning in a hierarchy of learning methodologies based on time and learning environments, as seen in [Figure 1], and according to Cherian and Williams (2008) the differentiates between the four delivery methodologies is the way in which learning content are delivered since learning content can be delivered through each model, but the transmission channel usually differs (Cherian and Williams, 2008).

In general, they are some differences and similarities between M-learning and e-learning, e.g. each of them student-center learning and based on individual learning, and both of them allowing communication between teacher and students anywhere and at any time. M-learning use portable mobile devices, smartphones, tablet PCs, phablets, cellular phones, even the ultra-slim netbooks that rely on wireless network technology for the Internet connection and do not require presence in a specific place, while e-learning using desktop computers, and notebooks that rely wire fixed to connect the Internet and requires to be in a specific place (Charmonman and Chorpothong, 2005), (Laouris and Eteokleous, 2009). Specifically, M-learning gives ease communication between students, e.g. over SMS and MMS they can interconnect and exchange messages, and via Bluetooth they can sharing educational materials, and transferee files among themselves, in both cases not require presence in a specific place, but the communication in e-learning can be only by the Internet, with possibility of sharing files and e-books and exchange among students by e-mail, but they require sitting in front of the devices in a specific place (Sharma and Kitchens, 2004).

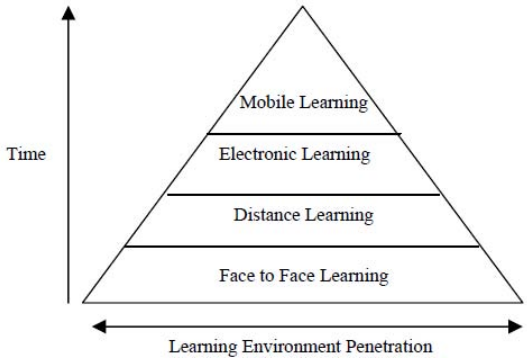


Figure 1: Hierarchical Learning Methodologies

In the light of the previous context, the M-learning form quite different from the traditional learning form, and has special characteristics like, small size and light weight of portable mobile devices, also flexibility to every time and everywhere (Attewell and Webster, 2004). More specifically, the portable mobile devices which can be

used them in M-learning identified by Quinn (2008) to: Netbooks or ultra-slim notebooks, Wearable mini Computers, Tablet PC, iPads, Phablets, Smartphones, iPhones, PDAs, Cellular Phones, E-books readers, personal digital multimedia players, and portable gaming consoles.

Based on services of portable mobile devices and their applications in learning process and according to Hartnell-Young and Heym (2008) M-learning provides essential services and possibilities, such as, basic communications between learners using Wi-Fi or Bluetooth and NFC for sending and receiving voice and messaging by SMS, MMS. Also, by GPS (service global positioning system) the learners can access GIS (Geographic Information Systems), and they can use digital compass to determine their movements, which are useful in scientific trips or even in determining their path when traveling between different regions. The training is another service of using mobile devices; a recent training provides training for most of the educational programs via applications like Videoconference or sending multimedia files such as video, Word, PDF, and slides of PowerPoint presentations to trainees via Internet (Sampson, 2006). Multimedia creation is one of the most services of mobile devices and a popular method for learning "on the move", however, when the learners outside the classroom they could use camera to take scientific pictures (JPEG or GIF), especially when they are doing scientific tours. Also by microphone they could record sound files and digital notes during their scientific experiments or their lectures using smartphones, digital media players, or iPods, also, the digital pen (stylus) could use to drawing charts or designing of electronic geographic maps (Weiss, 2004).

On the other hand, interactive social networks for social entertainment needs is one service from portable mobile devices since most mobile devices connect directly to the popular social network sites (Facebook, Twitter, Youtube, LinkedIn, etc.), for example, Facebook offers collaborative discussions, by sending questions, assignments to a group of learners. Furthermore, Twitter provides micro-blogging service to enhance students interactive. Additionally, mobile Web (Web Information), is another important service provided by mobile devices since the learner can access many educational materials, and sharing them by e-mail, or by blogs, or by wiki, or they can use E-Readers to browse electronic books, newspapers, magazines, and language dictionaries or scientific dictionaries (Gadd, 2010).

The benefits of mobile devices and M-learning in the field of education identified by Kukulska-Hulme and Traxler (2005), some of these benefits included, flexibility and freedom in learning, social interaction skills and cooperative learning, self-learning and self-assessment by short tests or quizzes, and taking into account the individual differences, in addition, engage learners to interest in education, collaboration between educators and learners by sharing assignments, automation of assessments of learners, and allows immediate feedback (Osang, et al., 2013). But to catch these major benefits and to apply the M-learning and portable mobile devices in the field of learning they should have special specifications such as, ease of use, and support self-learning skills, however, these devices should have technical specifications to operate efficiently when used in learning purposes, such as, a microphone and speaker, light and Gyro sensor to detect the mobile phone rotation, Internal 3G or 4G antenna to access the Internet (Kurbel and Hilker 2003), and (Sharples, et al., 2007). In addition, powerful camera, large memory capacity to store data, screen size with good resolution, and operating system to run educational application (Naismith, et al., 2004).

Regarding to Economides and Nikolaou (2006) the usable and accessible M-learning system based on mobile devices should have standards and criteria to design their learning content, from those criteria are: usability, technical, and functional criteria, however, usability criteria belong to user-interface with simple navigation menus and multiple languages, easy to read text and write, paint, play and records multimedia. Technical criteria belong CPU performance, Ram, screen, microphones, speakers, Wi-Fi, Bluetooth, GPS, support deference operating systems. Functional criteria belong communication tools, such as phone, SMS, MMS, e-mail, Web, Chat, videoconferencing, and fax, then information management tools such as clock, calendar, organizer, agenda, planner, and reminder.

In the implementation of an M-learning project, a technology selection roadmap were identified by Attewell (2005), as he suggests five general categories of technology that should be considered when implementing M-learning, these were: transport, delivery, platform, development languages, and media technologies, as demonstrated in [Figure 2], however, connectivity and transport by using different communication technology, now, with the widening capability of mobile devices, learners and teachers can access the internet using WiFi /WLAN, 3G or 4G, GPRS or GPS, Bluetooth, IrDa, NFC, QR (Quick Response Code), and RFID (Radio Frequency Identification). Delivery technology includes WAP, E-MAIL, SMS, MMS, HTTP (WEB). Platform and Operation systems technology contains Windows phone, iOS, Android, Blackberry, and before were Pocket Pc and Palm OS. Development languages technology of programs and Apps include Flash enabled web, Images and text based webpages, by using Flash, Java, C, C++, HTML, XHTML, etc., finally, media technologies to

support video and audio files (MP3, WMA, MP4, M4A, AAC, AVI, 3GP formats etc.), phone calls, teleconferencing, and voice recognition (Attewell, 2005), (Cobcroft, et al., 2006), and (O'Connell and Smith, 2007).

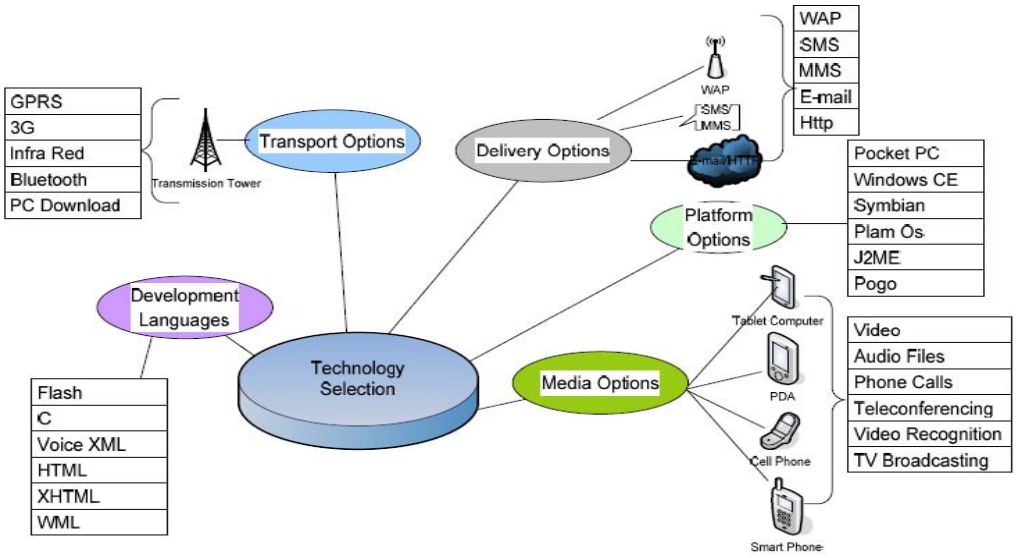


Figure 2: Technology Selection Roadmap of M-learning Environment (Chanchary and Islam, 2009)

In general, reviewing the previous research studies which applied the mobile devices and implemented M-learning in the field of education, some attitudes and perceptions were investigated, a major of benefits and opportunities were found, parallel, a number of challenges and barriers were appeared, however, in Malaysia (2007) Jacob and Issac search the attitudes of students' university towards M-learning, the study sample included 250 students from the engineering department and the business section. The results of their study revealed that (79%) of the study sample believe that there is no need to go to the library or labs of computers to access the Internet, a (74%) of them believe the easy to access the content of their courses, and (33 %) of the students emphasize ease of communication between teachers and students and their colleagues (Jacob and Issac, 2007). And also**,** in Saudi Arabia, a survey by Al-Fahad (2009) aimed to understand and measure students' attitudes and perceptions towards the effectiveness of mobile learning on one hundred eighty six undergraduate female students at King Saud University. Result of this survey clearly indicated that offering mobile learning could be our method for improving retention of B.A, and M.D. students, by enhancing their teaching and learning (Al-Fahad, 2009). Moreover, Khwaileh and AlJarrah (2010) investigated the graduate students' perceptions towards M-learning at university of Jordan, the results showed that there were no negative opinions towards M-learning held by the participants, and the students are willing to use M-learning and they believe that M-learning has a lot of advantages (Khwaileh and AlJarrah, 2010).

Uzunboylu and Ozdamli (2011) created an available instrument that assesses teachers' perceptions of m-learning in Cyprus. However, they developed version of mobile learning perception scale which includes dimensions seeking teachers' feedback on three facets of the m-learning. Sub-dimensions are defined as 'Aim-Mobile Technologies Fit', 'Appropriateness of Branch', and 'Forms of M-learning Application and Tools' Sufficient Adequacy of Communication', and after that, they tested the reliability and validity of the final version on a sample of 467 teachers from the 32 schools in 2010. The findings of the study showed that this instrument can be used for the future studies, and according to the results, teachers exhibited above medium levels of perception towards M-learning (Uzunboylu and Ozdamli, 2011). Also, in Cyprus, Serin, 2012 analyzed mobile learning perceptions and mobile learning levels of the prospective teachers at a university in Turkish Republic of Northern Cyprus according to their departments and gender. "Mobile Learning Perception Scale" was used for data collection, and applied on 355 prospective teachers. Descriptive statistics, t-test and variance analysis were used to analysis of the data. As a result of the research, it was found out that mobile learning perceptions and mobile learning levels of the prospective teachers showed no significant difference according to the department and gender variables. As a result it was found out that prospective teachers' mobile learning perception levels were low (Serin, 2012).

Furthermore, a report by Perry (2003) defined main barriers about Handheld Computers (PDAs) in school as: cost, lack of support and training, printing and battery problems (the necessity to charge battery every day), small screens, lack of print-out capability, the time it takes to input data and text, costs of software. Moreover,

the findings of study by Facer, et al., (2005) revealed to technical difficulties with the devices used in M-learning by handheld computers, such as, synchronizing the device with a PC, or laptop, navigation and file storage, short battery life, paucity of appropriate mobile software, lack of teacher confidence and lack of training impacted negatively on their teaching, together with uncertainty as to how the devices might best be used to enhance teaching and learning. Furthermore, Krämer (2005) presented some challenges of mobile learning that need to be addressed, such as, the small screens of mobile devices limits the type and amount of information that can be displayed and made it difficult to read the details. Lack of input devices such as mouse, keyboard or stylus pen slow down text input speed and reduce the device's usability with respect to the interaction between man and machine. The lack of suitable multimedia player and viewer software (flash, Java, video, audio, etc.) on mobile devices disallows the use of animations and moving graphics. Finally, limited storage capacity and intermittent or slow connection rates since requires downloading, uploading, caching of educational materials.

Cherian and Williams (2008) indicated a few barriers to the distribution of course content in an M-Learning environment; content hosting and network infrastructures exist. Also, Chanchary and Islam (2009) clarified that the factors of M-learning environment can be treated as technical challenges, like, memory size of mobile devices is crucial while downloading learning materials. Battery life: shorter battery life of handheld devices can create negative stimuli among learners. Smaller screen size and compact buttons (keys) can discomfort learners. Interfaces of mobile phones are reduced to the essentials. Furthermore, learning materials could be in various file formats and not all formats are supported by the processing platforms of mobile devices.

In 2011 Martin Addison listed other three barriers related the learning content that is deliver by using of mobile devices in learning and that were preventing organizations from adopting M-learning, the first barrier is the lacked engaging educational content since the existing platforms focused on text-based content and had a very narrow breadth of subject areas related training, the second is too long content, which was designed for e-learning not for a learner on-the-move, the third barrier is that the content was designed for a large screen devices not designed for a small screen devices, e.g. learning navigation designed for a laptop screen was not easy to use on a touchscreen device (Addison, 2011). And also, Saleem (2011) classified the challenges hinder the implementation of mobile learning to three categories, technological, educational and general challenges, first, technological challenges: small screen and small keyboards used in mobile learning applications, short battery virtual age, and low storage capacity, second, educational challenges: designing and preparing educational mobile curricula, digital and technological gap between students in using mobile learning applications, and cheating in M-learning process, finally, general challenges: high cost, needs an infrastructure, wireless networks and modern mobile learning devices, and some security breaches for wireless and wire networks.

Recently, a study by Osang, et al., (2013) discussed the benefits and prospects of implementing mobile learning in Nigeria, and they aimed to identify the challenges which will be responsible for the sustenance of mobile learning by open and distance learners (ODL) educators and students, they confirmed the technical challenges of mobile learning include: different screen seizes, device limitations, training, safety, security, maintenance, and the implementation cost, then, they applied a questionnaire on 80 educators to identified barriers to mobile learning, and the findings of the study indicated that 75% of the educators believe that the poor learning environment will greatly affect the teaching and learning activities using mobile phone, the findings indicated that 73% of the educators are of the opinion that technologies usually create expertise in the technology rather than the actual knowledge it is meant to deliver (Osang, et al., 2013).

In general, the majority of previous studies held in different countries and they focused on attitudes and perceptions of teachers or students' university towards M-learning, and other studies indicated main or a few barriers, or presented some challenges of M-Learning environment, and they have used scales or surveys to reach their aims. In particular, implementation of M-learning environment needs applications and design tools such as: Blackboard mobile for Mobile management. Bump, Inkling, KeneXa, HotLava Mobile, Drop Vox, Course Smart and Edmode for Authoring Tools. Pocket, Pen ultimate, Iannontate, Ever note (Brown and Haag, 2011).

The current research adopted the Edmodo (co-founded and designed by Nick Borg and Jeff O'Hara in 2008) as a newly M-learning tool to present the course content and to achieve research aims, for many reasons, first, the appearance of Edmodo and its functionality closely be similar to that of Facebook and almost all the students are already familiar with that social network, see [Capture 1], second, Edmodo is a safe social networking community that provides an educational micro blogging environment for teachers and learners, also it can be seen as a multi-platform Learning Management System (LMS) which can facilitate educators to set up and manage their online classes easily (Witherspoon, 2011), third, Edmodo it has become a popular virtual M-

learning platform because it is a secure, ease to use, accessible via web browser and a free smartphone app for Windows phone, iOS, Android, etc., it is provides a virtual space for teachers and educators to share and discuss ideas, and files (text, images, audio, and video) through mobile devices. Furthermore, teachers can send notes (SMS), and alerts to individual students, and also, send assignments and quizzes, receive completed assignments, and conduct polls. Students can also share content, submit homework, assignments, and quizzes, receive their teacher's feedback, notes, and alerts, as well as vote on polls (Jarc, 2010). Overall, Edmodo is a simple; it is friendly user interface, common to all operation systems of smartphones, provides useful tools for students and teachers to interact online outside class anywhere, anytime (Hourdequin, 2014). Basically, students may like Edmodo since it easy for them to connect and work with their classmates and teachers online, and they may not cause students to face any difficulties. In addition, teachers may like Edmodo because it provides simple functions for teachers to create and manage their online classroom community, finally, Edmodo offers privacy to both teachers and their students (Kongchan, 2013).

Capture 1: Screen Capture for Edmodo Interface

RESEARCH METHODOLOGY

The current research followed the empirical approach to investigate the students' perceptions levels of Edmodo and Mobile learning, and to identify the real barriers of Edmodo and M-learning that facing the students at Taibah University, by applying two scales on the research sample: students' perceptions scale of Edmodo and Mobile learning, and barriers scale of Edmodo and Mobile learning. The research population included undergraduate students who study Teaching Means course at Taibah University, and the main research sample was 32 students from one classroom of Teaching Means course.

RESEARCH TOOLS

Edmodo App, perceptions scale and barriers scale were used to achieve the aims of the research. Both of students' perceptions scale and barriers scale for Edmodo and M-learning have prepared and constructed from literature review and related studies, however, the perceptions scale consisted of 36 multiple choice statements, each statement has five choices according to Likert scale divided into three fields: Measurement and Academic Achievement (13 items), Mobile Communication and Interaction Resources (6 items), and Information Access (17 items), 31 items were Positive and five items were Negative (No. 12, 17, 30, 33 and 35) see [Table 3]. Choices' options ranged from strongly agree to strongly disagree (strongly agree, agree, undecided, disagree, strongly disagree), five scores to the most positive statement and one score to the most negative were given. The scores given to the scale ranged from 36 to 180, therefore, scores means of perception scale was explained in three levels ranged as low (36- 84), average (85 - 133) and high (134-180). High scores indicate positive perceptions and low scores show negative perceptions. And also, the barriers scale consisted of 17 multiple choice items each item has five choices based on Likert scale, 13 items were Positive and four items were Negative (No. 3, 9, 10, and 15) see [Table 4], and choices' options ranged as perceptions scale. The validity of the two scales confirmed after consulting six assessors (professors of Teaching Means) from the Department of Educational Technology at Taibah University, who pointed to the appropriateness of the purpose for which they were prepared and they indicated some comments and useful suggestions to modify some statements and items from them. The reliability of these scales were significantly inter-correlated ($p \leq 0.05$) and each component statement /item was significantly correlated with its summated variable, with Cronbach Alpha $\alpha = 0.69$ for overall the perceptions scale, and with Cronbach Alpha $\alpha = 0.77$ for overall the barriers scale.

PROCEDURES OF THE RESEARCH AND DATA COLLECTION

Before starting the implementation of the experiment, the researcher clarified what is Edmodo, and what is the aim of the research for the 32 students (main sample), and the students were asked whether they were participating in experiment or not, after that applied the perceptions and barriers scales on five students from the

participants, and they answered the scales in 25- 30 minutes, and this indicated to the readiness of the scales for final applying.

Looking at the [Table 1] labeled Item-Total Statistics, it is seen the reliability statistics of the two scales, with Cronbach Alpha coefficient, the reliability found as a good Cronbach Alpha $\alpha = 0.69$ for overall the perceptions scale, however, an acceptable Cronbach Alpha $\alpha = 0.72$ for field of Measurement and Academic Achievement, a good Cronbach Alpha $\alpha = 0.70$ for field of Mobile Communication and Interaction, and an acceptable Cronbach Alpha $\alpha = 0.61$ for field of Information Access. And also, found as a good Cronbach Alpha $\alpha = 0.77$ for overall the barriers scale, however, all values of reliability coefficient for barriers scale items were accepted according to the study sample since they are higher than 0.56. For that reason, this suggests that the reliability among student samples was well established for perceptions scale items and barriers scale items too. Then, started teaching the students by Edmodo using smartphones, almost, the experiment lasted for nearly eight weeks from first of March 2014 to 31 of May 2014, see [Capture 1 and 2].

Table 1: Item-Total Statistics of Perceptions Scale and Barriers Scale

Scale	No.	Scale Fields	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Perceptions	1	Measurement and Academic Achievement	225.4444	105.718	.291	.729
	2	Mobile Communication and Interaction	249.5926	114.635	.353	.703
	3	Information Access	205.8889	91.872	.507	.615
	Overall Scale Fields		**136.1852**	**35.003**	**1.000**	**.693**
Barriers	**Overall Scale**		47.89	89.256	.727	.77

TEACHING STEPS USING EDMODO

At the beginning of the semester, identified the course content and the number of students for experimentation, and before starting the experiment the researcher registered in www.edmodo.com using an email address, after singing up to Edmodo, created a group entitled “Teaching Means”, then received a code to give it to students to join the group (Kongchan, 2012).

After that, started teaching the students using smartphones through Edmodo, at the beginning of the teaching process sent user guide of Edmodo for the students, then put title of the course that will be teaching, also at the beginning of each lecture defined the lecture objectives, and then upload course files related the lecture as PDF, and course syllabus as Win Word to Edmodo students, then sent Edmodo user guide link on YouTube, see [Capture 3], then start discussing course subjects, after that asking questions to make sure from understand the course content, then given some examples to emphasize the important course concepts, and sent some websites links, then asked activities from the students to following course, finally, made quizzes with short answer.

Capture 2: Screen Capture for Last Date of Edmodo Experiment

Capture 3: Screen Capture for Teaching Using Edmodo

DATA ANALYSIS

Descriptive statistical analysis were used, the data obtained from responses of the study sample was coded and analyzed using SPSS (Statistical Packages for Social Sciences version 16), specifically, Cronbach Alpha, means and standard deviation were used, however, to ensure reliability for the perceptions scale and barriers scales used Cronbach Alpha, to consider the students' perceptions levels of Mobile learning used means of scores and standard deviation for responses on perceptions scale, and to identify the real barriers of M-learning used means and standard deviation of scores for responses on barriers scale.

FINDINGS AND DISCUSSION

The present research aimed to investigate the students' perceptions levels of Edmodo and Mobile learning and to identify the real barriers of Edmodo and M-learning that facing the students at Taibah University, in other words, the research attempts to answer the two questions: What are the perception level of the students towards Edmodo and M-learning at Taibah University? What are the real barriers facing the students in Edmodo and M-learning at Taibah University? The results of the statistical analysis displayed the means of scores and standard deviation for responses on overall fields of perceptions scale was presented in [Table 2].

Table 2: Mean and Standard Deviation of the Responses on Fields of Perceptions Scale

No.	Scale Fields	N	Minimum	Maximum	Sum	Mean	Std. Deviation
1	Measurement and Academic Achievement	27	40	53	1267	46.92	3.583
2	Mobile Communication and Interaction	27	17	27	615	22.77	2.516
3	Information Access	27	56	75	1795	66.48	3.609
Overall Fields		27	123	149	3677	**136.19**	5.916

As presented in the above [Table 2], it is clear enough that students' perceptions of Edmodo and Mobile learning is in “High” level in general since the mean of overall fields of perceptions scale is 136.19 belongs the high-level range (134-180), this result summarizes the positive perceptions of students towards Edmodo and Mobile learning, however, as show in [Table 3], the higher mean score was for the statements “I think that learning using Edmodo facilitates interaction and communication between teacher and learner” with mean (4.63), SD (.792) and highest percentage of strongly agree (77.8%), the second mean score for the statements was “I appreciate Edmodo because it allows me to learn at the right time” with mean (4.59), SD (.747) and percentage of strongly agree (70.4%), and the third mean score for the statements were two items “I feel that the use of Edmodo and M-learning increase the effectiveness of learning”, and “I believe that Edmodo and M-learning are aspects of scientific progress in the present era.” with similar means (4.56), but different SD (.698 / .641), and different percentage of strongly agree (66.7% / 63%).

In fact, these results discovered that there are preferential perceptions among students of Taibah university (research sample) towards using Edmodo and M-learning, and these positive perceptions could be traced to many reasons, such as, the majority of students are proficient in dealing with mobile phones especially in their daily life matters, so they do not have any fear feeling of use it in learning. And also, there is effect of Edmodo

on their perceptions on increased contribute of interaction and communication between them and the teacher, and this result is confirmed by negative items as seen in [Table 3], however, the lowest mean score was the statement "I think that learning using Edmodo does not facilitate communication between students and each other" with mean (1.67), SD (.734) and high percentage of strongly disagree (48.1%) which confirm that Edmodo facilitate communication between students. Moreover, the second lower mean scores were two statements, "The best study of my courses away from the Edmodo and M-learning", and "Edmodo does not generate effective learning environment" with equal means (1.93), but different SD (1.299 / 1.174), and with the highest percentage of strongly disagree (55.6% / 44.4%), regarding the study sample, it is certifying that the Edmodo and M-learning not only facilitate and increase the effectiveness communication of learning, but also save students' time. All these results are confirmed by some studies as Jacob and Issac (2007), Al-Fahad (2009), Khwaileh and AlJarrah (2010), but these results conflicts with study held by Serin (2012) because she found out that prospective teachers' mobile learning perception levels were low.

Table 3: Mean and Standard Deviation of the Responses on Perceptions Scale

No.	Scale Items	Sum	Mean	Std. Deviation
	First field: Measurement and Academic Achievement			
1	I expect that Edmodo and M-learning can be used to increase the motivation to learn.	109	4.04	1.192
2	I see that the use of Edmodo in learning helps in getting immediate feedback.	98	3.63	1.363
3	I feel that learning using Edmodo and M-learning contributing into development my academic achievement.	98	3.63	1.305
4	I feel that the use of Edmodo and M-learning increase the effectiveness of learning.	123	4.56	.698
5	I believe that my achievement of the course is possible to increase after the use of Edmodo and M-learning.	102	3.78	1.121
6	I agree with the possibility of making quizzes through the Mobile phone.	109	4.04	1.427
7	I think that using Edmodo and M-learning lead to enrich the learning course.	108	4.00	1.144
8	I think that using Edmodo and M-learning develop self-learning skills among students.	106	3.93	1.072
9	I think that the use of Edmodo and M-learning help in evaluating the course continuously.	114	4.22	.934
10	I think that the use of Edmodo and M-learning help in develop of critical thinking.	56	2.07	.917
11	Edmodo can be used to enhancement the traditional learning.	94	3.48	1.252
12	Edmodo does not generate effective learning environment.*	52	1.93	1.174
13	Edmodo facilitates learning the university course.	98	3.63	1.182
	Second field: Mobile Communication and Interaction			
14	Edmodo and M-learning remove the limitation of place and time.	108	4.00	1.209
15	I believe that Edmodo and M-learning encouraging the interaction and participation of isolated students.	118	4.37	.839
16	I feel that Edmodo fosters the collective cooperation among students.	113	4.19	1.111
17	I think that Edmodo cannot be used to facilitate communication between students and each other.*	45	1.67	.734
18	I think that learning using Edmodo facilitates interaction and communication between teacher and learner.	125	4.63	.792
19	I think that the learning using Edmodo stronger social relations between students.	106	3.93	1.141
	Third field: Information Access			
20	By Edmodo and M-learning I can have a prompt access to educational materials that I need.	117	4.33	1.144
21	Edmodo and Mobile learning are easier than learning with the traditional learning.	104	3.85	1.262
22	I'm enjoying when using a Mobile device in study of the university courses.	113	4.19	.921
23	Using Edmodo to save time and effort to get the information.	119	4.41	.797
24	Access the course information become easier when using Edmodo.	119	4.41	.888
25	I would like to recognize the skills of using Edmodo and M-learning.	116	4.30	1.235
26	I feel that Edmodo contributes to the development search skills.	113	4.19	1.178
27	I join with those who are interested in talking about Edmodo and Mobile	107	3.96	.940

	learning.			
28	By Edmodo and Mobile learning I can access course information in any time and at any place.	106	3.93	1.269
29	I believe that Edmodo and M-learning are aspects of scientific progress in the present era.	123	4.56	.641
30	I have no desire to participate in discussion related to Edmodo and M-learning.*	53	1.96	.980
31	I am trying to find out more information about the use of Edmodo and M-learning.	116	4.30	.912
32	I would like to attend workshop about the skills of using Edmodo and M-learning.	110	4.07	1.072
33	The best study of my courses away from the Edmodo and M-learning.*	52	1.93	1.299
34	I appreciate Edmodo because it allows me to learn at the right time.	124	4.59	.747
35	I prefer reading my courses in paper form not reading them by Edmodo and Mobile device.*	83	3.07	1.207
36	I feel that using Edmodo and M-learning save my time and my effort to get course materials.	120	4.44	.801

Regarding the second research question: What are the real barriers facing the students in Edmodo and M-learning at Taibah University? The results of the means of scores and standard deviation for responses on barriers scale were reported in [Table 4].

Table 4: Mean and Standard Deviation of the Responses on Barriers Scale

No.	Scale Items	Sum	Mean	Std. Deviation
1	I find it is difficult to use Edmodo as mobile learning application.	75	2.78	1.050
2	I am concerned during learning using Edmodo.	69	2.56	1.121
3	I do not feel bored when I read my course by Edmodo.*	88	3.26	1.259
4	I feel upset when answering questions by Edmodo and using mobile phone.	59	2.19	.962
5	I do not trust the authenticity of the information that I get them through Mobile phone and Edmodo.	64	2.37	1.006
6	I feel upset in solving exercises and activities using application of Edmodo for mobile learning.	73	2.70	1.103
7	I see that use of Edmodo as a mobile learning application would negatively affect the acquisition of the skills of reading and writing to me.	66	2.44	1.086
8	Difficult to store large files in my mobile phone.	85	3.15	1.262
9	I think that Edmodo as a mobile learning application does not lead to social isolation for students.*	75	2.78	1.219
10	I feel that use of Edmodo as a mobile learning application does not limit the difficulty of the course.*	85	3.15	1.027
11	I see the difficulty of organizing a discussions or educational dialogue through Edmodo.	80	2.96	1.255
12	I think that Edmodo focus on the cognitive side more than technical skills and emotional aspects.	76	2.81	1.111
13	I feel that the cons of Edmodo more than the positives.	72	2.67	1.109
14	Small screen size of mobile phone hinders the process of display the information in Edmodo on Mobile phone.	74	2.74	1.318
15	I do not find it is difficult to enter the information on the small screen size of mobile phone.*	91	3.37	1.305
16	I'm suffering from poor communication network	69	2.56	1.396
17	I'm having a problem of low mobile battery continuously.	92	3.41	1.421

In general, the results clear means that the real barriers of Edmodo and Mobile learning are in normal range since the mean of overall barriers scale is 46 belongs the average level (40- 69), however, as [Table 4] shows the means of barriers scale, and the higher mean score was for the positive statement "I'm having a problem of low mobile battery continuously" with mean (3.41), SD (1.421) and highest percentage (68.15%), next the mean score for the statement "Difficult to store large files in my mobile phone" with mean (3.15), SD (1.262) and low percentage (63%), these results reveal the common barrier when using mobile for a long time per a day. The two

negative statements, "I do not find it is difficult to enter the information on the small screen size of mobile phone" with mean (3.37), SD (1.305) and percentage (67.4%), and "I do not feel bored when I read my course by Edmodo" with mean (3.26), SD (1.259) and percentage (65%), as it seen, despite these barriers, most students (research sample) are not boring using the small screen size, so it is not affected learning. For the above results, it could be said, a common barriers facing the students in Edmodo and M-learning, these barriers belong M-learning in general and they are not belong Edmod in specific, and that might be reported as barriers or challenges since earlier findings of other studies were parallel act a few of them as barriers, like Perry (2003), Facer, et al., (2005), Krämer (2005), Chanchary and Islam (2009), (Addison, 2011), Saleem (2011), and Osang, et al., (2013).

CONCLUSION AND RECOMMENDATIONS

In light of the research finding, it can be concluded that undergraduate students at Taibah University have positive perceptions towards Edmodo as an application for Mobile learning environment because it has many benefits in support learning process such as facilitate and increase effectiveness communication of learning, and they appreciate Edmodo since its allows them to learn at the right time, but every new learning environment has some barriers, and Edomdo and M-learning environment is not different, however, some barriers holding M-learning back from full implementation, and the near future will overcome these barriers, for example, the battery of mobile devices will last longer and better yet, it will be replaced all together by solar power technology, processors in mobile devices will get faster. Finally, the researcher recommends encouraging universities to add a section for mobile learning to start application of M-learning at the university level, to hold workshops for both students and professors to clarify the educational services of M-learning tools such as Edmodo, and to prepare a use manual or an visible and audible guide for using of mobile devices in teaching and learning.

REFERENCES

Addison, M. (2011). m-Learning: a cautionary tale. *Training Journal*. [On-line]. Available: http://www.trainingjournal.com/blog/articles-blogs-m-learning-a-cautionary-tale/

Al-Fahad, F. N. (2009). Students' attitudes and perceptions towards the effectiveness of mobile learning in King Saud university, Saudi Arabia. *The Turkish Online Journal of Educational Technology (TOJET), 8* (2), 111-119. [On-line]. Available: http://www.tojet.net/articles/v8i2/8210.pdf

Ally, M., Lin F., McGreal, R. and Woo, B. (2005). An Intelligent Agent for Adapting and Delivering Electronic Course Materials to Mobile Learners. [On-line]. Available: http://www.mlearn.org.za/CD/papers/Ally-an%20intelligent.pdf

Alzaidiyeen, N. J., Abdullah, A. G. K., & Al-Shabatat, A. M. (2011). The information aged: Examination of university students' attitudes towards Personal Digital Assistants (PDAS) usage in terms of gender, age and school variables. *The Turkish Online Journal of Educational Technology (TOJET),* 10 (3), 287-295. [On-line]. Available: http://www.tojet.net/articles/v10i3/10333.pdf

Attewell, J. (2005). From Research and Development to Mobile Learning: Tools for Education and Training Providers and their Learners. *Proceedings of mLearn 2005*. [On-line]. Available: www.m**learn**.org.za/CD/papers/Attewell.pdf

Attewell, J. and Webster, T. (2004). Engaging and Supporting Mobile Learners. In Attewell, J. and Savill-Smith, C. (Eds.), *Mobile learning anytime everywhere: A book of papers from MLEARN 2004*. Pp. 15-20, London,

UK: Learning and Skills Development Agency. [On-line]. Available: http://www.mobilearn.org/download/events/mlearn_2004/MLEARN_%202004_book_of_conference_papers.pdf

Chanchary, F. H, Islam, S. (2009). Mobile learning in Saudi Arabia - Prospects and Challenge. *Proceedings of 5th international conference on e-learning*. Penang, Malaysia. [On-line]. Available: http://www.nauss.edu.sa/acit/PDFs/f2535.pdf

Charmonman, S., and Chorpothong, N. (2005). Digital Lifestyle and the Road Ahead. *Proceedings of the 4th International Conference on eBusiness*. December 5-9. Beijing, China. [On-line]. Available: http://charm.siamtechu.net/SCPaper/Digital%20Lifestyle%20and%20the%20Road%20Ahead.pdf

Cherian, E. and Williams, P. (2008). Mobile Learning: The Beginning of the End of Classroom Learning. *Proceedings of the World Congress on Engineering and Computer Science 2008*. WCECS 2008, October 22 - 24, 2008, San Francisco, USA.

Cobcroft, R. S., Towers, S., Smith, J. and Bruns, A. (2006). Mobile learning in review: Opportunities and challenges for learners, teachers, and institutions. *ProceedingsOnline Learning and Teaching (OLT) Conference 2006*. Pp. 21-30, Queensland University of Technology, Brisbane. Retrieved March 16, 2014, from: http://eprints.qut.edu.au/5399/1/5399.pdf

Economides, A. A. and Nikolaou, N. (2006). Evaluation of handheld devices for mobile learning. *International Journal of Engineering Education*. Forthcoming. [On-line]. Available: http://conta.uom.gr/conta/publications/PDF/Evaluation%20of%20Handheld%20Devices%20for%20Mobile%20Learning.pdf

Facer, K., Faux, F. and McFarlane, A. (2005).Challenges and Opportunities: Making Mobile Learning a Reality in Schools. *Proceedings of mLearn 2005: 4th World Conference onMobile Learning*. [On-line]. Available: http://www.mlearn.org.za/CD/papers/Facer%20-%20Faux%20-%20McFarlane.pdf

Gadd, R. (2010). mLearning Trends. [On-line]. Available: http://mlearningtrends.blogspot.com/2010/10/mlearning-feature-sets-possibilities.html

Hartnell-Young, E. and Heym, N. (2008). How mobile phones help learning in secondary schools. A report to Becta,

March 2008. Copyright University of Nottingham. [On-line]. Available: http://www.ifap.ru/library/book330.pdf

Hourdequin, P. (2014). Edmodo: A Simple Tool for Blended Learning. *The Language Teacher38* (1). [On-line]. Available: http://jalt-publications.org/tlt/departments/tlt-wired/articles/3547-edmodo-simple-tool-blended-learning

Hung M.L., Chou C., Chen C.H. & Own Z.Y. (2010). Learner readiness for online learning: scale development and student perceptions. *Computers & Education.* Vol. 55, Issue 3, 1080–1090.

Jacob, S. and Issac, B. (2007). Mobile Learning Culture and Effects in Higher Education. *IEEE Multidisciplinary Engineering Education Magazine*. Vol. 2, No. 2, June 2007.

Jarc, J. (2010) Edmodo – a free, web 2.0 classroom management tool. [On-line]. Available: http://trendingeducation.com/?p=190

Khwaileh, F., M. and AlJarrah, A., A. (2010**).** Graduate Students' Perceptions Toward Mobile- Learning (M-Learning) at the University of Jordan. *International Journal of Instructional Technology and Distance Learning*. Vol. 7. No. 10, October 2010. [On-line]. Available: http://www.itdl.org/Journal/Oct_10/article02.htm

Kongchan, C. (2012). How a Non-Digital-Native Teacher Makes Use of Edmodo. *International conference* "*ICT for Language Learning*" 5th *edition.*

Kongchan, C. (2013). How Edmodo and Google Docs Can Change Traditional Classrooms. *The European Conference on Language Learning 2013*.

Krämer, B. (2005) Mobile Learning: The Next Generation of Learning, FernUniversität's Contributions to the 2nd Year of the Project, Technical Working paper, FernUniversität in Hagen, Version 1. [On-line]. Available: http://learning.ericsson.net/mlearning2/files/workpackage4/feu_technical_working_paper_2.pdf

Kukulska-Hulme, A. and Traxler, J. (2005). Mobile Learning: A handbook for educators and Trainers. Taylor and Francis, New York, USA.

Kurbel, K. and Hilker, J. (2003). Requirements for mobile e-learning platform. In Hamza, M. (Ed.), *Proceedings of IASTED International Conference on Communications, Internet, and Information Technology*. Pp. 467-471.

Laouris, Y. and Eteokleous, N. (2009). We Need an Educationally Relevant Definition of Mobile Learning. [On-line]. Available: http://www.mlearn.org.za/CD/papers/Laouris%20%26%20Eteokleous.pdf

Mehdipour, Y. Zerehkafi, H. (2013). Mobile Learning for Education: Benefits and Challenges. *International Journal of Computational Engineering Research*, Vol. 03, Issue 6. [On-line]. Available: http://www.ijceronline.com/papers/Vol3_issue6/part%203/P03630930100.pdf

Naismith, L., Lonsdale, P., Vavoula, G. and Sharples, M. (2004). Literature Review in Mobile Technologies and Learning. *FutureLab*. [On-line]. Available: http://www2.futurelab.org.uk/resources/documents/lit_reviews/Mobile_Review.pdf

O'Connell, M. and Smith, J. (2007). A Guide to Working with M-learning Standards A Manual for Teachers, Trainers and Developers. Version 1.0, Australian Flexible Learning Framework, Australian Government, Department of Education, Science and Training.

Osang, F., Ngole, J. and Tsuma, C. (2013). Prospects and challenges of mobile learning implementation in Nigeria: Case study National Open University of Nigeria (NOUN). *Proceedings of "8th International Conference on e-Learning (ICEL-2013)"*. Cape Town, South Africa. [On-line]. Available: http://www.ictforafrica.org/attachments/section/4/ict4africa2013_submission_50.pdf

Oxford dictionary (2014). From Online Oxford dictionary. [On-line]. Available: http://www.oxforddictionaries.com/definition/english/perception

Paliwal, S. and Sharma, K.K. (2009). Future Trend of Education – Mobile Learning Problems and Prospects. *International Conference on Academic Libraries (ICAL-2009)*. India. [On-line]. Available: http://crl.du.ac.in/ical09/papers/index_files/ical-113_101_229_2_RV.pdf

Perry, D. (2003) *Handheld Computers (PDAs) in Schools*. *International Workshop on Wirelessand Mobile Technologies in Education (WMTE)*, Taiwan, March 23-25. p.3. Becta Home Page. [On-line]. Available: http://www.becta.org.uk/research/reports/docs/handhelds.pdf.

Pisey, S., Ramteke, P.L. and Burghate, B.R. (2012). Mobile learning exploring the challenges and opportunities of distance education. *Proceedings of "National Conference on Emerging Trends in Computer Technology (NCETCT-2012)"*. Held at R.C.Patel Institute of Technology, Shirpur, Dist. Dhule, Maharashtra, India. 2012, 2 (3):19-23. [On-line]. Available: http://worldjournalofscience.com/index.php/wjst/article/viewFile/13152/6648

Quinn, C. (2008). mLearning Devices Performance To Go. *A Quinnovation.* White Paper © 2008. [On-line]. Available: http://www.quinnovation.com/MobileDevices.pdf

Riyadh Newspaper (2012). Saudi Arabia occupies first place worldwide in terms of number of users of mobile phones. Number: 16211, Sunday, 11th November 2012, KSA. [On-line]. Available: http://www.alriyadh.com/2012/11/11/article783418.html

Saleem, T., A. (2011). Mobile Learning Technology. *International Journal of Instructional Technology and Distance Learning*. Vol. 8. No. 10, October 2011. [On-line]. Available: http://www.itdl.org/Journal/Oct_10/Oct_10.pdf

Sampson, D. (2006). Exploiting Mobile and Wireless Technologies in Vocational Training. *Proceedings 4th IEEE International Workshop on Wireless, Mobile and Ubiquitous Technology in Education***.** Copyright © 2006 by The Institute of Electrical and Electronics Engineers, Inc.

Serin, O. (2012). Mobile Learning Perceptions of the Prospective Teachers (Turkish Republic of Northern Cyprus Sampling). *The Turkish Online Journal of Educational Technology (TOJET)*, 11 (3), 222-233. [On-line]. Available: http://www.tojet.net/articles/v11i3/11321.pdf

Sharma, S. K. and Kitchens, F. L. (2004). Web Services Architecture for M-Learning. *Electronic Journal on e-Learning*. Vol. 2, Issue 1. Pp. 203-216.

Sharples, M., Taylor, J., and Vavoula, G. (2007). A theory of learning for the mobile age. In Andrews, R. and Haythornthwaite, C. (Eds.), *The Sage handbook of e-learning research*. Pp. 221-247. London: Sage Publications.

The Free dictionary (2014). From Free dictionary. [On-line]. Available: http://www.thefreedictionary.com/barrier

Traxler, J. (2005). Defining Mobile Learning. *Proceedings IADIS International Conference Mobile Learning 2005*, Malta. Pp. 261-266.

Uzunboylu, H., & Özdamlı, F. (2011). Teacher perception for m-learning: scale development and teachers' perceptions. *Journal of Computer Assisted Learning, 27* (6), 544-556.

Vavoula, G. and Sharples, M. (2009). Meeting the Challenges in Evaluating Mobile Learning: A 3-level Evaluation Framework. *International Journal of Mobile and Blended Learning*, 1(2). Pp. 54-75.

Weiss, D. (2004). Using mobile phones and pocket PCs for creating, delivering and retrieving content on the fly, based on mobile web browsers. In Attewell, J. and Savill-Smith, C. (Eds.), *Mobile learning anytime everywhere: A book of papers from MLEARN 2004*. Pp. 213-216, London, UK: Learning and Skills Development Agency. [On-line]. Available: http://www.mobilearn.org/download/events/mlearn_2004/MLEARN_%202004_book_o_conference_papers.pdf

Witherspoon, A. (2011). Edmodo...A Learning Management System. [On-line]. Available: http://www.poweredwithtechnology.com/2011/01/edmodoa-learning-management-system.html

Technology Acceptance of Healthcare E-Learning Modules: A Study of Korean and Malaysian Students' Perceptions

Assoc. Prof. Dr. Mai NEO
Faculty of Creative Multimedia, Multimedia University, Malaysia
neo.mai@mmu.edu.my

Prof. Dr. Heykyung PARK
U-design Department, Design Institute, Inje University, South Korea.
dehkpark@inje.ac.kr

Min-Jae LEE
U-design Department, Design Institute, Inje University, South Korea.
mjleeworld@nate.com

Jian-Yuan SOH
U-design Department, Design Institute, Inje University, South Korea.
matthias2001my@hotmail.com

Ji-Young OH
U-design Department, Design Institute, Inje University, South Korea.
ojy1245@gmail.com

ABSTRACT
Educators today are moving towards transforming their teaching and learning methods from conventional teacher-centered approaches to student-centered learning approaches with the support of technology so as to better motivate students to participate and engage in their learning process. This study was developed as a joint collaborative effort between Inje University, South Korea, and Multimedia University, Malaysia, in order to investigate Korean and Malaysian students' perceptions of an e-learning web module about health rooms in Korea. An e-learning web module was developed using Mayer's (2001) Principles of Multimedia Learning and presented to Korean and Malaysian students. A Technology Acceptance Model (TAM) survey was developed to measure their perceptions of this e-learning website. Results show that students were positive in the Perceived Usefulness (PU) and Perceived Ease-of-Use (PEOU) constructs which in turn resulted in positive Attitudes towards Usage (ATU) and Behavioral Intentions to Use (BIU) constructs in the application. The results thus show positive technology acceptance of the e-learning health room web module and provide positive encouragement for educators to develop interactive healthcare modules for e-learning.

INTRODUCTION
Educators today are moving towards transforming their teaching and learning methods from conventional teacher-centered approaches to student-centered learning approaches with the support of technology so as to better motivate students to participate and engage in their learning process. ICT has been shown to be an enabler that provides educators with flexibility and creativity, and its rapid growth has become a driving force for educators to innovate and enhance their teaching and learning methodologies, and, consequently, progress towards higher engagement levels of their students (Vallance, 2008; Lee, Yoon & Lee, 2009; Park, 2009; Sivapalan & Wan Fatimah, 2010). Consistent with this is the challenge from today's students, coined "digital natives" by Prensky (2001), who are technology-savvy and expect to have some form of technology-supported curriculum in their learning process. As such, McLoughlin and Lee (2010) have suggested that the education landscape evolve to accommodate such changes and take advantage of their benefits for teaching and learning on a global scale (Laurillard, 2013). Research has also shown that these technological advancements directly influence the way educational content is now being taught, bringing about changes in the roles of student and teachers in the classrooms (Mahajan, 2012), and making learning more meaningful (Dembo & Seli, 2012).

A popular method of using technology-supported teaching, or e-learning, involves providing students with online access to their learning materials. Educators are transforming their curricula into e-learning materials that involve multimedia elements and interactivity, uploading them onto an online system that would allow students to have access to them outside of classrooms (Palloff and Pratt, 2013), and allowing educators to "*tap the power of visual and verbal forms of expression in the service of promoting student understanding"* (Mayer, 2003). Such a learning environment is deemed to be student-centred as students are empowered with the control and activity of these online modules. In such a learning environment, students are active in their learning process and

are involved in acquiring and navigating through the content in the learning modules at their own pace (Svensson & Ostlund, 2007).

South Korea and Malaysia are two of the countries in Asia that have sought to follow in the global educational trend towards innovating curricula and adopt more technology-supported classrooms. The rapid growth of ICT in South Korea has had significant impact on the development of e-learning (Misko, Choi, Hong & Lee, 2005; Kim & Santiago, 2005; Park, 2009), and the "Law for Developing On-Line Digital Contents Industry" was legislated by the South Korean Government for universities to develop digital content and produce more IT graduates for their IT companies (Lee et. al, 2009). In Malaysia, the 'Blueprint on Enculturation of Life-Long Learning for Malaysia 2011-2020' by the Malaysian Ministry of Higher Education (MOHE, 2011), advocates the need to incorporate creativity and innovation into the education system in order to empower 21st century graduates and to embed student-centred learning approaches into the design of their classes. As such, institutions of higher learning in Malaysian are beginning to incorporate ICT materials in developing e-learning methods and in web-based courses (Hong, Abang Ekhsan & Zaimuarifuddin, 2005; Suraya, 2005; Yap, Neo & Neo, 2013).

However, despite the move towards e-learning and technology-supported classrooms, there is still little research on the acceptance of such systems and how they affect the quality of learning among the students' learning process (Lee, 2006, Liaw, 2008; Lee et. al, 2009; Liu, Liaw & Pratt, 2009; Leem & Lim, 2007; Park, 2009). In addition, educators still lack confidence in their e-learning developments and proper pedagogical frameworks for designing effective e-learning and student-centred materials are still needed (Chung, 2008; Martin & Klein, 2008), Therefore, this research study seeks to investigate Korean and Malaysian students' perceptions of e-learning modules and provide insights for Korean and Malaysian educators to design effective e-learning applications. Mayer's (2001) Principle of Multimedia Learning was employed as the theoretical framework to designing and developing the module, and the Technology Acceptance Model (TAM) was used to measure students' attitudes and perceptions towards such a learning environment. As such, this study proposes to answer the research question, "What are the perceptions and attitudes of Korean and Malaysian students towards an interactive e-learning web module?"

STUDENT-CENTRED E-LEARNING ENVIRONMENTS

Limitations of conventional teaching methods have led to more student-centred learning approaches being incorporated into the teaching and learning methodologies. Defined as the learning process in which the focus in on the students and their control over the pace and content of their learning materials (Griffiths, Oates & Lockyer, 2007; Baeten, Kyndt, Struyven & Dochy, 2010). The American Psychological Association Board of Educational Affairs lists four categories of principles that define student-centred environments (Alfassi, 2004):

1. Cognitive and metacognitive factors, where the learning process is constructed so that learners become aware of their thinking and learning
2. Motivation and affective factors, which relate to the interest of the students in their learning process
3. Developmental and social factors, where a positive learning climate and relationship is established and facilitates meaningful learning among learners and teachers
4. Individual differences where the learning mode accommodates the different learning capabilities of the learner

As a result, many learning environments today are moving towards student-centred learning approaches that put students at the centre of the learning process. In these environments, students are active participants in their learning process, with more alternatives in identifying the learning goal, obtaining necessary resources, and making some decisions in the learning process, rather than just passively receiving what was given or be controlled by the teachers (Griffiths, Oates & Lockyer, 2007). By having the strategy of giving students more control and interactions, their interests and motivation levels would be enhanced. In addition, when hypermedia and interactive contents are used, the learning setting is broadened and students' learning experiences are enriched (Alessi & Trollip, 2001). And with the incorporation of media elements, the pedagogical strength in engaging student learning is improved, and learning is enlivened as it adds richness and meaning to the information presentation through the use of more than one medium (Ma, O'Toole & Keppell, 2008). Subsequently, the web has provided educators with a platform for disseminating their interactive course materials asynchronously to students outside of the physical classroom walls. With the advent of e-learning as an innovative method of teaching, educators are provided with more flexibility in creating exciting learning environments.

THE TECHNOLOGY ACCEPTANCE MODEL (TAM)

Many e-learning materials have been developed to address the issue of creating technology-supported classrooms that would be accessible to students asynchronously. However, the lack of confidence and

pedagogical support, as mentioned above, results in a discrepancy in the effectiveness of such applications. Moreover, as students become more technologically-savvy (Prensky, 2001), it is thus important to assess their acceptance of the many e-learning applications presented to them. The Technology Acceptance Model (TAM) has been a proven model to capture the key determinants of students' intentions to use a particular application (Schroff, Deneen & Ng, 2011).

The technology acceptance model (TAM) was developed by Davis (1989) to explain how students would accept and use a certain technology. According to this theory, there are a number of key factors that would determine whether or not a student would use the technology:

1. Perceived Usefulness (PU), whereby a student would use the technology if s/he perceived it to be useful to them
2. Perceived Ease-of-Use (PEOU), whereby a student would use the technology is s/he perceived it to be easy to use and without much effort
3. Attitudes towards usage (ATU), which represents how a student feels about the technology

According to the model, PU and PEOU are the cognitive factors that the student experiences, while ATU is the positive or negative evaluative effect that the student will have when considering using a particular application, and will ultimately guide him or her to use that application. External variables such as the content of the application, how the user navigates around the system, and features of the application are also deemed to influence students' PU and PEOU (Cyr, Head & Larios, 2010; Gaines & Curry, 2011; Schroff et. al, 2011). Consequently, the model further posits that these characteristics would have significant influences on the student's behavioural intention to use (BIU) the technology (Davis, 1989; Ajzen & Fishbein, 2000; McKinnon & Igonor, 2008; Schroff et. al, 2011). Figure 1 shows the conceptual representation of TAM as developed by Davis, Bagozzi & Warshaw (1989).

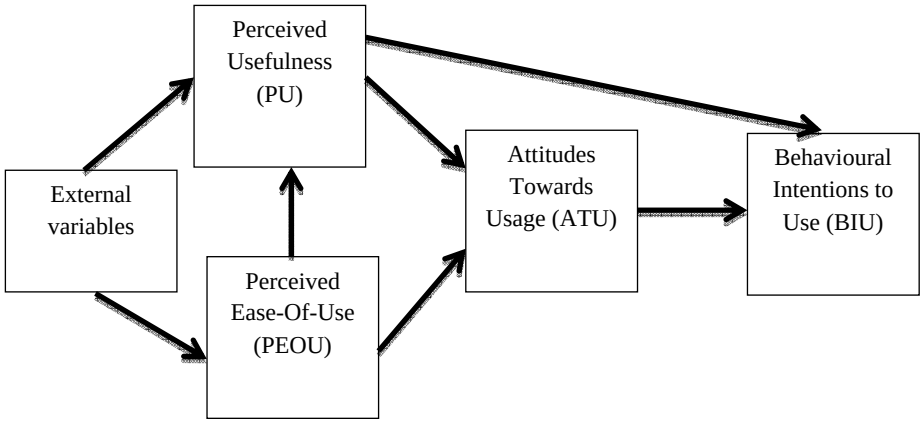


Figure 1 The TAM (Davis et.al, 1989)

In this study, the TAM illustrated in Figure 1 was adapted and used to investigate technology acceptance of an e-learning healthcare module amongst Korean and Malaysian students.

METHODOLOGY: DESIGNING THE E-LEARNING ENVIRONMENT

The study was a collaborative research effort between Inje University's School of Design, South Korea, and Multimedia University's Faculty of Creative Multimedia, Malaysia, to investigate both Korean and Malaysia students' perceptions and attitudes towards e-learning environments. The study was funded by South Korea's BK21 Plus Healthcare USD Design Research Group in Inje University, which looks into designing proper healthcare environments for Korean and international societies. One of the initiatives was to investigate the acceptance of health rooms in Korean schools, based on their designs such as colour, furniture, location, etc. As such, schools with enrolment rates of 300 and above were selected by the Korean Government to create appealing health rooms, as part of the Korean Government's Health Room Modernization Service initiative. As such, content for the web module was obtained from 10 Korean health rooms located in Busan city, South Korea. Images were taken to show the interior and exterior of these health rooms, the furniture, colour, and individual rooms in each health rooms. All health rooms in the sample had images of these areas to maintain consistency in the presentation of the visuals in the module.

The web module was developed incorporating Mayer's (2001, 2003) principles of multimedia learning and cognitive load. According to Mayer's (2003) cognitive theory of multimedia learning, incorporating multimedia elements into a learning module must be considered in the design of the application, as well as the impact of its interactivity and feedback on student learning, and that the combination of various media elements contribute to determining learners' educational effectiveness, and is critical to the success to having a positive impact in multimedia learning, as it puts the learner in control. The seven principles are Multimedia Principle, Spatial Contiguity Principle, Temporal Contiguity Principle, Coherence Principle, Modality Principle, Redundancy Principle, and Individual Differences Principle and are listed in Table 1 below (Mayer, 2001):

Table 1 Mayer's 7 Principles of Multimedia Learning

Design Principle	Principle's Explanation
1. Multimedia Principle	Use text and graphics together to enhance learning experience.
2. Spatial Contiguity Principle	Arrange related text and graphics close to each other on the screen to enhance learning.
3. Temporal Contiguity Principle	Have the related text and graphics to appear at the same time on the screen to enhance learning.
4. Coherence Principle	Irrelevant or additional text, graphics, and audio are not included on the screen.
5. Modality Principle	The combination of animation and narration will enhance students' learning.
6. Redundancy Principle	Text shall not be included when animation and narration are presented on the screen.
7. Individual Differences Principle	Students who are new learners for the module and high-spatial learners would have better learning effect from the design.

These principles were incorporated into the web module to create the web module. The modules were presented in both Korean and English languages, whereby Koreans students would access the Korean site, and Malaysian students would access the English site. However, both languages were available at all times, for students to explore. Figure 2 shows the introduction page, which utilises Mayer's Multimedia Principle of using text and graphics together.

Figure 2 The introduction page with Korean and English language options and an graphical image

Figure 3 shows an example of Mayer's Spatial Principle in the module. As can be seen in Figure 3, graphics and text are placed next to each other in order to support the message of the image. This fundamental principle allows students to process both visually and textually the same content, thus creating an enhanced learning experience for them and to enable a more effective processing of the information onscreen.

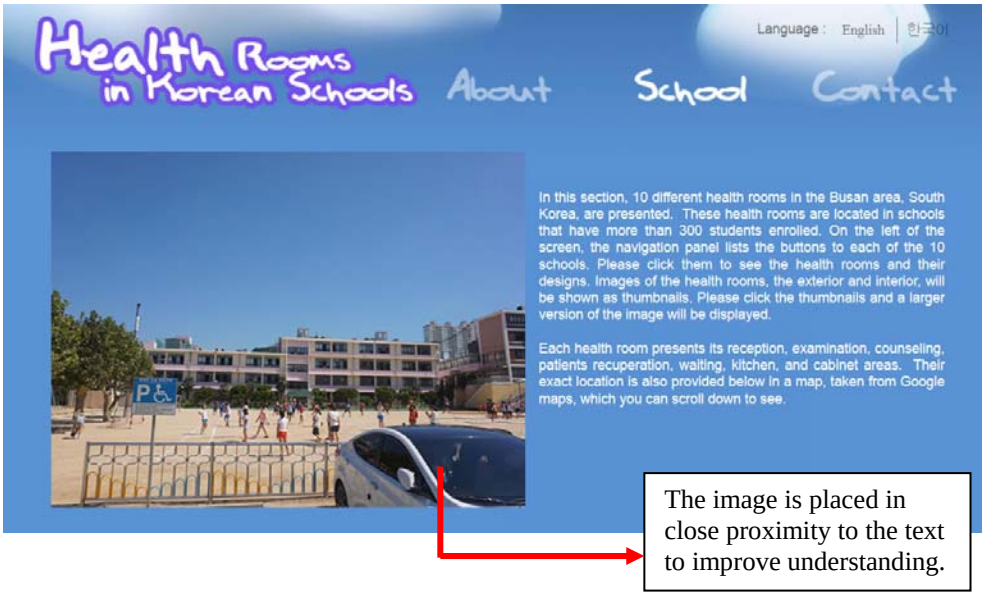


Figure 3 Mayer's Spatial Contiguity Principle (Text and graphics are placed close to each other to create a more effective learning process).

Mayer's (2001) Temporal Contiguity Principle states that text and graphics should be presented at the same time to facilitate a better learning process. In Figure 4, each of the school's images appears when the user clicks any of the thumbnails. Textual explanations and descriptions of each of the images appear at bottom of each image at the same time. That way, learners will be able to focus on the information presented, and not experience any cognitive overload.

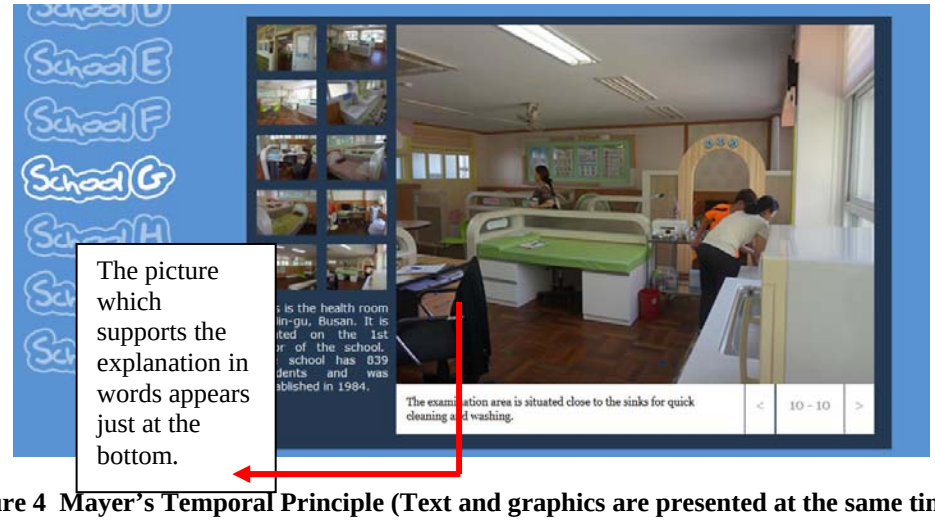


Figure 4 Mayer's Temporal Principle (Text and graphics are presented at the same time).

The module also incorporated Mayer's (2001) Coherence Principle, whereby irrelevant text or graphics were not included in the module. Since the module would be an e-learning and informative module, extraneous information would only heighten the confusion and comprehension of the content. Therefore, information that related to the images in the schools were presented. However, in order to improve the presentation of the content, a live map of each of the schools was embedded into the pages. These maps were obtained from Google Maps and were embedded so that learners would be able to visualise the location of the schools in real-time. In addition, using live Google Maps would not only show the locations of these schools, but learners could also see street views of the schools. This would narrow any distance issues for learners who do not reside in Korea or near the areas of the schools, and thus, be an effective tool to enhance the learning of the content. Figure 5 shows the image of the schools with Google Maps embedded.

Figure 5 Mayer's Coherence Principle (only relevant text and graphics are embedded).

This module was uploaded into the university server and accessible 24/7. A mixed-method research design was used in this research, using both quantitative and qualitative data collection instruments. A survey questionnaire was designed to measure students' attitudes and perceptions toward the module. The questionnaire adapted the Technology Acceptance Model by Davis (1989) to gauge learners' Intentions to Use (IU) the module. According to Davis (1989), the Technology Acceptance Model (TAM) was designed to measure learners' BIU based on their Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which would influence their Attitudes Towards Usage (ATU) and Behavioral Intentions to Use (BIU), as previously shown in Figure 1. The questionnaire also contained open-ended items to solicit student comments and feedback on the module.

The items on the questionnaire were designed to gauge 3 constructs which would measure students' perceived usefulness (PU) and perceived ease of use (PEOU), which were: 1) Content, 2) Visual Appeal and 3) Navigation. Content and Visual Appeal constructs would generate results for students' Perceived Use (PU) and the Navigation construct would generate results for students' Perceived Ease of Use (PEOU).

A total of 133 students participated in the study. Subjects were undergraduate students from the School of Design, Inje University, and the Faculty of Creative Multimedia, Multimedia University. There were 67 Korean undergraduates and 66 Malaysian undergraduates who participated. The questionnaires were translated in Korean (for the Korean students) and verified by language experts in the faculty, to maintain the integrity of the items asked.

ANALYSIS AND RESULTS

A multi-item Likert scale questionnaire was created to gauge students' perceptions on the usefulness and ease of use of the module, and were designed using research constructs from the literature. The questionnaire scale ranged from 5 = Strongly Like, 4 = Like, 3 = Undecided, 2 = Dislike, and 1 = Strongly Dislike. Students were presented this module in a computer laboratory setting, so every student could view it from his or her computer. They were given 30 minutes to view the module and complete the survey questionnaire. The data were analysed using SPSS 16 and cross-tabulations of the data shows the breakdown of students by nationality and gender. Table 2 presents these results.

Table 2 Crosstabulations of students by gender and nationality

		Nationality		
		Korean	Malaysian	Total
female	Count	46	33	79
	% within Student's gender	58.2%	41.8%	100.0%
	% within Korean or Malaysian	68.7%	50.0%	59.4%
	% of Total	34.6%	24.8%	59.4%
male	Count	21	33	54
	% within Student's gender	38.9%	61.1%	100.0%
	% within Korean or Malaysian	31.3%	50.0%	40.6%
	% of Total	15.8%	24.8%	40.6%
Total	Count	67	66	133
	% within Student's gender	50.4%	49.6%	100.0%
	% within Korean or Malaysian	100.0%	100.0%	100.0%
	% of Total	50.4%	49.6%	100.0%

As can be seen in Table 1, there is an even percentage of Malaysian males and females in the sample, but Korean females make up the majority of the Korean sample data (68.7% Korean females, Korean 31.3% males). There were also more females than males in the sample (59.4% females, 40.6% males). Analysis of the questionnaire yielded a Cronbach Alpha coefficient of 0.915, which clearly showed that the survey was reliable (Lim, Khine, Hew, Wong, Shanti & Lim, 2003). Further analysis of the data showed that students were positive towards the e-learning module and results are presented in Table 3.

Table 3 Means and percentage of favourable answers (ranked) from the survey questionnaire

Items on survey questionnaire	**Mean**	**Std. Deviation**	**%**
1. Understanding of content	4.02	.793	80.5
2. Ease of navigation	4.02	.853	78.2
3. Ease of buttons and links to navigate	3.99	.754	82.0
4. Increased understanding of Korean Health rooms	3.90	.787	74.4
5. Suitability of furniture for health rooms	3.90	.852	75.9
6. Instructions were easy to understand	3.90	.852	73.7
7. Suitability of colours of the health rooms	3.86	.760	72.9
8. Liked the colours of the rooms	3.77	.966	66.9
9. Informative and useful website	3.72	.742	64.7
10. Important information were easy to find	3.65	.826	58.6
11. Just the right amount of information on screen	3.65	.817	60.9
12. Motivated to learn more	3.64	.873	54.1
13. Interface was appealing	3.62	.877	57.1
14. Liked interaction with website	3.62	.832	60.9
15. Enjoyed learning from the website	3.58	.955	54.9
16. Liked learning about health rooms in Korea	3.56	.762	57.1
17. Found website interesting	3.53	.926	53.4
18. Graphics made content easy to understand	3.53	1.049	54.9
N= 133			

In terms of the technology acceptance model, the survey developed measured three constructs: 1) Content, 2) Visual Appeal, and 3) Interactivity and Navigation. As mentioned earlier, Content and Visual Appeal constructs

would generate results for students' Perceived Use (PU) and the Navigation construct would generate results for students' Perceived Ease of Use (PEOU). Table 4 presents the items mapped to the TAM.

Table 4 Items on the survey that correspond to students' PU and PEOU

Items on survey	TAM
Content	Perceived Usefulness (PU)
Understanding of content	
Increased understanding of Korean Health rooms	
Informative and useful website	
Just the right amount of information on screen	
Found website interesting	
Visual Appeal	Perceived Usefulness (PU)
Suitability of furniture for health rooms	
Suitability of colours of the health rooms	
Liked the colours of the rooms	
Motivated to learn more	
Interface was appealing	
Enjoyed learning from the website	
Liked learning about health rooms in Korea	
Interactivity and navigation	Perceived Ease-Of-Use (PEOU)
Ease of navigation	
Ease of buttons and links to navigate	
Instructions were easy to understand	
Important information were easy to find	
Liked interaction with website	
Graphics made content easy to understand	

The survey can be further broken down to show Korean and Malaysian students' perceptions, as shown in Table 5 and 6 below.

Table 5 Top 10 highest ranked means for the Korean sample

Items on survey questionnaire	Mean	Std. Deviation	%
1. Ease of buttons and links to navigate (PEOU)	4.03	.674	88.1
2. Understanding of content (PU)	4.00	.758	79.1
3. Suitability of furniture for health rooms (PU)	3.97	.758	79.1
4. Ease of navigation (PEOU)	3.94	.776	70.1
5. Increased understanding of Korean Health rooms (PU)	3.85	.764	71.6
6. Suitability of colours of the health rooms (PU)	3.84	.687	62.7
7. Instructions were easy to understand (PEOU)	3.82	.869	68.7
8. Liked learning about health rooms in Korea (PU)	3.69	.743	62.7
9. Just the right amount of information on screen (PU)	3.69	.857	65.7
10. Liked the colours of the rooms (PEOU)	3.66	.880	62.7
N = 67			

The Korean sample survey yielded a Cronbach Alpha of 0.905, which satisfies the requirements of reliability (Lim, Khine, Hew, Wong, Shanti & Lim, 2003). As shown in Table 5, Koreans students reported favourable attitudes towards the items in the survey questionnaire, with many items scoring over the midpoint of 3 on the scale. 88% of Korean students reported that they found the buttons and links in the module easy to understand and were able to bring them to the correct pages (m=4.03), and 79% were able to understand the content in the website (m=4.00), both of which ranked first and second in the survey. The third highest item in the survey was

the suitability of the furniture of the health rooms, with a mean of 3.97, as reported by 79% of the students. Navigation was also favourably reported by 70% of the students (m=3.94), as were the instructions in the website (3.82, 69%), which enabled them to gained more knowledge of Korean health rooms (m=3.84, 71.6% of students reporting), and received enough information on each screen to process (m=3.69, 66%). 63% of students also found that the colors chosen for the healthrooms in the website were suitable for the students who will be using them (m=3.84, and m=3.66). Overall, the majority of Korean students liked using the website to learn about health rooms in Korea (m=3.69, 63%).

Table 6 Top 10 highest ranked means for the Malaysian sample

Items on survey questionnaire	Mean	Std. Deviation	%
1. Ease of navigation (PEOU)	4.09	.924	86.4
2. Understanding of content (PU)	4.08	.829	81.8
3. Instructions were easy to understand (PU)	3.98	.832	78.8
4. Ease of buttons and links to navigate (PEOU)	3.95	.831	75.8
5. Increased understanding of Korean Health rooms (PU)	3.95	.812	77.3
6. Suitability of colours of the health rooms (PU)	3.88	.832	78.8
7. Suitability of furniture for health rooms (PU)	3.83	.938	72.7
8. Enjoyed learning from the website (PU)	3.82	.893	66.7
9. Informative and useful website (PU)	3.82	.700	74.2
10. Important information were easy to find (PEOU)	3.80	.769	68.7
N = 66			

Analysis of the Malaysian students survey yielded a Cronbach Alpha of 0.922, which also satisfies the requirements for a reliability (Lim, Khine, Hew, Wong, Shanti & Lim, 2003). As shown in Table 6, for the Malaysian students, the ease of navigation of the module was the highest ranked item in the survey, with 86.4% of students and a mean of 4.09, and 4th highest ranked item (75.8%, m = 3.95). They also reported that they were able to understand the content (m = 4.08, 81.8%), found the instructions easy to understand (m=3.98, 78.8%) and that the website was informative and useful (m=3.82, 66.7%), as important information were easy to find (m=3.80, 68.7%). 78.8% also reported that they found the colours chosen for the health rooms to be suitable for students (m=3.88, 78.8%), and that the furniture in these health rooms were also suitable for its purpose (m=3.83, 66.7%). Overall, 77.3% of students found that they were able to gain more understanding of Korean health rooms from the website (m= 3.95).

STUDENTS' COMMENTS

In addition, the survey also sought to solicit open-ended comments from students on their perceptions of the web application. These comments would further support students' perceived usefulness and perceived ease-of-use of the web application and provide insights as their attitudes and intentions to use the application. Students' comments can also be categorised according to content, interactivity and navigation, and visual appeal. Some of the comments are presented in Tables 7-9 below (Note: The comments are taken verbatim).

Table 7 Korean and Malaysian students' comments on Content of the web application

CONTENT (Perceived Usefulness)
Korean students' comments
"It's useful and necessary. I didn't that interested in these contents before, but after using this website, I had a chance to know this information a lot" *"I think it is useful…it is necessary since it is difficult to get access to this information"* *"Need! People need it for their children's environment, as beneficial to the family that are wondering"* *"…people that want to view n know more about health unit will come to this website"* *"Elementary school children are easy to get weak/ill, having a health unit to be taken care of are relieved(for parents) to be able to know from the site"* *"Many of the parents worry or problem, allowing them to get the peace of mind"* *"…necessary, because to know about the condition of the health unit"* *"…useful, able to know about Korea and the school health unit facilities"* *"useful and necessary, able for parents to know"* *"necessary, parents and children able to know about the school facilities through this site. they will feel safe"*
Malaysian students' comments

"very useful because of the information they provide" *"..people from other country can learn about Korean health room"* *"…it is useful. They provide plenty of information of the health room"* *"..take care of health of their student should be a part of the job of a school"* *'..it can educate people about health room"* *"Really useful…I can see the different between health rooms in Malaysia and Korea"* *"..it can be used as a learning website for Malaysians on how to improve our health rooms"* *"..for parents and kids to learn more about health rooms"* *"..for student to know the facilities in the room"* *"…it given opportunity to other people to learn about health rooms in Korea and allow other school to reference and make their health room better"* *"Absolutely useful and necessary – for instance, those information would be useful for parents, students themselves, evaluation purposes, etc."* *"…Malaysians can get ideas on how to renovate their health rooms here in Malaysia"*

Table 8 Korean and Malaysian students' comments on Visual Appeal of the web application

VISUAL APPEAL (Perceived Usefulness)
Korean students' comments
"I think the website has a good user interface design" *"..it's good because it together with photos and descriptions"* *"good to able to view various health unit in once"* *"It was convenient to use due to having photos"* *" A sense of stability and gives a comfortable feel"* *"Thats good use of comfortable color able to rest and go."* *"Design was appropriate for students"* *"It wasn't that boring due to photos."* *"I liked that I could look the interior of the health rooms closely."* *"The color scheme of interior and other elements are well coordinated"* *"Used colours that the children's eye will find it interesting, able to make them feel safe and relax"* *"I liked the detailed explanation and lots of photographs"* *"I think the website has a good user interface design."* *"I like the simple and neat design."* *"I like that I could take a look the facilities of schools through the photographs. And I like the color on the website!"*
Malaysian students' comments
"I'm enjoying it" *"Nowadays, youngsters are getting more on their electronic devices. So this is interesting website of health is one of the way for the young generation to learn more knowledge"* *"Colour scheme is nice and comfortable…It is calm…patients are able to rest peacefully"* *"I like the colour. It catch my eye attention. Good!"* *"I like about the interface in the design because it looks simple and nice"* *"The colours are soft, it won't make people's eyes feel tired after watching it"* *"I think the color is bright and colourful. Sets up the mood for the student"* *"Calm and relaxing"* *"It's appealing and isn't too striking for the eyes too"* *"Nice. The colour scheme is cool temperature"* *"Smooth, comfortable. Cozy"* *"I particularly liked the pictures of the health rooms"* *"Variety of pictures"* *"I like the design because it is modern and minimalist"* *"I like the character which placed in the ABOUT page…I like the colour palette for the health room as the design is simple. And it makes the health room looks nice and tidy"* *"I like the design concept. It is not too complicated"* *"Very appealing and appropriate for the topic"* *"Colours used for this website were suitable according to the furniture and light in respective rooms"* *"Great. Very calming ad it ease the mind. Somehow it reduce stress"*

Table 9 Korean and Malaysian students' comments on Interactivity and Navigation of the web application

INTERACTIVITY AND NAVIGATION (Perceived Ease-Of-Use)
Korean students' comments
"Since there are table of contents, I could fine what I want to know quickly" *"Able to see one school's health room with one click."* *"..it easy to view photos"* *"Good because each school for each classification, along with detailed photo"* *"Each school is given a separate point was good to hear"* *"Design and location of the health unit where it is easy to know that it was good"* *"Simple configuration and easy to find on the Internet"* *"Since there are table of contents, I could fine what I want to know quickly."* *"It was easy to use."* *"I liked that I could check the information available simply with just a few mouse clicks."* *"It was easy to use because of simple and well-ordered design."* *"I liked the website is so simple and easy to use."*
Malaysian students' comments
"Easy to navigate" *"Information and navigation is easy to understand"* *"…easy access to the information"* *"…convenient for people to search and learn more on it"* *"…navigation is simple and easy"* *"It is easy to navigate on this website"* *"It is easy to access"* *"It is easy to navigate through. There was no broken links and I got where I want to easily"* *"User-friendly and easy to navigate"* *"The navigation is most appealing for this website"*

From the comments, it can be seen that both Korean and Malaysian students were very positive about the 3 constructs in the survey, which further provided strong support for the Likert scale results in Tables 5 and 6. The majority of them reported that the web application contained content that was easy to understand and very useful. Many Korean students commented that the website would be a useful and necessary application for parents to feel safe knowing about the state and condition of their children's health rooms in schools, and also on the safety of the these students knowing what their health rooms would look like prior to going to them. Malaysian students commented that the website would be a good reference for Malaysian schools to use to improve or develop their own health rooms in school.

With regards to visual appeal, Korean students commented on the use of photographs as the media element to making the website more appealing. Many commented that these photographs, coupled with the textual content, were complementary in providing the necessary information about the health rooms, making the application enjoyable to engage in. These were also supported by comments from the Malaysian students who found the design of the website to also be appealing. Overall, both Korean and Malaysian students found the colours used in the website to exude calmness and relaxation when browsing through the content, which they commented to be suitable for the web application.

Finally, the students also provided comments on the interactivity and navigation of the web application that also supported the quantitative results in Tables 5 and 6. Korean and Malaysian students commented on being able to access the photos easily and with one click, and that the navigation was easy to use. They also elaborated on the user-friendliness of the website in terms of having "*..no broken links*" and its "*simple configuration*" which made it "*…easy to find on the Internet*"

Therefore, results and comments for all 3 of these constructs show strong and positive support for the TAM model's perceived usefulness and perceived ease-of-use of the web application, and influencing their positive attitudes towards it. According to Davis' (1989) Technology Acceptance Model (TAM), perceived usefulness and perceived ease-of-use influence students' perceived intentions to use a particular system. Results of the study also show that students had positive intentions to use the web module. With regards of their perceived intentions to use the web module, both Korean and Malaysian students commented that they would use the website, with the following elaboration on some of them:

1. *"..I'd use it to get information. It could be so useful not only for children, but also their parents as well. When it comes to children's health, parents are always worried and concerned. Therefore, through this website, parents might get a chance to know about the health rooms' information and to take a look*

around the facility."

2. *"Yes, I'm going to use it."*
3. *"I'm going to use it when I need the information regarding the health rooms."*
4. *"I might often use the website because it's convenient to use."*
5. *"If there are more sample of health unit, I might use this website"*
6. *"Likely to visit in order to obtain the information"*
7. *"I can use it for an example for similar projects"*
8. *"Yes, for sure, as it is important to get every detail of the health rooms. And for this website, it satisfies the viewer in terms of the information needed"*

The students also provided helpful suggestions on the maintenance and continual improvements of the website in terms on updating the information, expanding the web module to include more health rooms, and to add more graphics to the site. However, these suggestions did not deter them from their positive perceived intentions to use the web application in the future.

DISCUSSION AND CONCLUSION

Based on the results above, the study was able to show that the web application, which was built on Mayer's (2001) Principles of Multimedia Learning, was successful in effecting positive students' perceived usefulness (PU), perceived ease-of-use (PEOU), and attitudes towards usage (ATU), of an e-learning web module on health rooms in Korea, and consequently, positive perceived intentions to use (PIU) the module in the future. In particular, the study showed that Mayer's (2001) Principles of Multimedia Learning was an effective theoretical framework to use to effect these positive perceptions. Students commented on the use of text and graphics together to enhance the content provided, the use of a character graphic in the ABOUT page to make the web module appealing, and the use of relevant information such as Google maps to further enhance the content.

Colour was an effective component of the module to engage students in the application. Students reported and commented on the suitable use of colour as a way to affect the mood of the audience and provide a calm and relaxing atmosphere for them to engage in the module. This result is consistent with Cyr, et. al's (2010) suggestion that *"website colour appeal is a significant determinant for website trust and satisfaction…"*(p.1), and Gaines & Curry's (2011) conclusion that colour has significant influences in learning environments.

Positive perceived usefulness and positive perceived ease-of-use have positive effects on students' perceived intentions to use, and is consistent with Davis' (1989) technology acceptance model (TAM). In this study, results showed that content and visual appeal were able to contribute to students' positive perceived usefulness, and interactivity and navigation contributed to students' positive ease-of-use. Both Korean and Malaysian students' reported that the web module was necessary and important for parents and children to know about school health rooms to enable them to feel safe and secure. These were further supported by their comments. While Korean students commented more about the necessity of the web module, Malaysian students commented on the usefulness of the web module as a reference for development or improvement for Malaysian health care rooms. User-friendliness and easy navigation were also important elements in their overall perceived intentions to use. Many commented that they would use the website because it provided useful information, was deemed necessary, was easy to use and convenient. These results were consistent with Schroff et. al's (2011) findings that user-friendliness and easy navigation were influential components in students' PU and PEOU of technology.

In conclusion, the web module and the use of Mayer's (2001) Principles of Multimedia Learning was an effective tool to engage students in interactive learning with an e-learning application. The technology acceptance model (TAM) was also an effective model to use to measure the attitudes and perceptions of students on the perceived usefulness and ease-of-use of the module and their consequent perceived intentions-to-use the module in the future. The study also provide insights into the attitudes and perceptions of Korean and Malaysian students towards using e-learning modules, and to gives educators further confirmation on the effectiveness of using sound multimedia and e-learning pedagogy in designing content that will engage and improve student learning.

ACKNOWLEDGMENTS

This study would like to thank Inje University's School of Design students and Multimedia University's Faculty of Creative Multimedia design students for their cooperation in participating in the research. This work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2014S1A5B8044097).

REFERENCES

Alessi. S. M. and Trollip, S. R. (2001). *Multimedia for Learning*. MA:Allyn & Bacon.

Alfassi, M. (2004). Effects of a learner-centred environment on the academic competence and motivation of students at risk. *Learning Environments Research 7*, 1 – 22, Kluwer Academic Publishers, Netherlands.

Ajzen, I. & Fishbein, M. (2000). Attitudes and the attitude-behavior relation: Reasoned and automatic processes. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (pp. 1-33). John Wiley & Sons.

Baeten, M., Kyndt, E., Struyven, K. and Dochy, F. (2010). Using student-centred learning environments to stimulate deep approaches to learning: Factors encouraging or discouraging their effectiveness. *Educational Research Review, 5*, 243 – 260.

Chung, K.C. (2008). Antecedent of Brand Trust in Online Tertiary Education: A Malaysian and Singapore Perspective. *International Journal of Business and Management, 3*(4), 3-10.

Cyr, D., Head, M. & Larios, H. (2010). Colour appeal in website design within and across cultures: A multi-method evaluation. *International Journal of Human-Computer Studies*, 68, pp. 1-21.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. http://www.jstor.org/pss/249008

Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982-1003. http://www.jstor.org/pss/2632151

Dembo, M.H. & Seli, H. (2012). Motivation and Learning Strategies for College Success: A Focus on Self-Regulated Learning. NY: Erlbaum.

Gaines, K.S. and Curry, Z.D. (2011). The inclusive classroom: The Effects of Color on Learning and Behavior. *Journal of Family & Consumer Sciences Education*, 29(1), pp. 46-57.

Griffiths, G., Oates, B.J. & Lockyer, M. (2007). Evolving a Facilitation Process towards Student Centred Learning: A Case Study in Computing. Journal of Information Systems Education, 18(4) [On-line]. Available: http://jise.org/Issues/18/V18N4P459-abs.pdf

Hong, K.S., Abang Ekhsan, A. O., & Zaimuarifuddin, N.(2005). Computer Self-Efficacy, Computer Anxiety, and Attitudes towards the Internet: A Study among Undergraduates in Unimas, *Educational Technology & Society*, Vol 8 (4), 205-219.

Kim, C., & Santiago, R. (2005). Constructions of e-learning environments in Korea. *Educational Technology Research and Development* 53(4), 108–114.

Laurillard, D. (2013). Keynote: Designing the pedagogies for student guidance on the larger scale. *63rd Annual Conference International Council for Educational Media 2013*, Oct 1-4 2013, Singapore.

Lee, H. (2006). Creating a knowledge-based society through e-learning in Korea. *Educational Technology Research and Development*, 54(5), 529–540.

Leem, J., & Lim, B. (2007). The current status of e-learning and strategies to enhance educational competitiveness in Korean higher education. *The International Review of Research in Open and Distance Learning*, 8(1). http://www.irrodl.org/index.php/irrodl/article/viewArticle/380/763

Lee, B. C., Yoon, J. O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computers & Education*, *53*(4), 1320-1329.

Liaw, S. S. (2008). Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system. *Computers and Education*, 51(2), 864–873.

Lim C.P., Khine M. S., Hew, T., Wong, P., Shanti, D. and Lim, B. (2003). Exploring critical aspects of information technologies integration in Singapore schools. *Australian Journal of Educational Technology*, 19(1), 1-24.

Liu, S.-H., Liao, H.-L., & Pratt, J. A. (2009). Impact of media richness and flow on e-learning technology acceptance. *Computers and Education*, 52(3), 599–607.

Ma, A. K. F., O'Toole, J., & Keppell, M. (2008). An investigation of student teachers' attitudes to the use of media triggered problem based learning. *Australasian Journal of Educational Technology*, *24*(3), 311-325.

Mahajan, G. (2012). Multimedia in Teacher Education: Perceptions and Uses. *Journal of Education and Practice, 3*(1), 5 – 13.

Martin, F. & Klein, J.D. (2008). Effects of Objectives, Practice, and Review in Multimedia Instruction. *Journal of Educational Multimedia and Hypermedia*, 17 (2), 171-189.

Ministry of Higher Education Malaysia, MOHE. (2011). Blueprint on Enculturation of Lifelong Learning for Malaysia 2011-2020. Malaysia: Univision Press.

Mayer R. E. (2001). *Multimedia learning*. Cambridge University Press. New York.

Mayer R. E. (2003). The promise of multimedia learning: using the same instructional design methods across different media. *Learning and Instruction* 13 (2003), 125–139.

McKinnon, K. & Igonor, A. (2008). Explaining eLearning perceptions using the Technology Acceptance Model and the Theory of Planned Behavior. In C. Bonk et al. (Eds.), *Proceedings of World Conference on E-*

Learning in Corporate, Government, Healthcare, and Higher Education 2008. Chesapeake, VA: AACE. http://www.editlib.org/p/30092

McLoughlin, C. and Lee, M. J. W. (2010). Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology* [Online], *26*(1), 28-43

Misko, J., Choi, J., Hong, S.Y., & Lee, I.S. (2005). E-learning in Australia and Korea: Learning from practice. *Korea Research Institute for Vocational Education & Training and National Centre for Vocational Education Research*. <http://www.ncver.edu.au/research/core/cp0306.pdf>.

Palloff, R. M., & Pratt, K. (2013). *Lessons from the virtual classroom: The realities of online teaching*. John Wiley & Sons.

Park, S. Y. (2009). An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use e-Learning. *Educational Technology & Society*, *12*(3), 150-162.

Prensky, M. (2001). Digital natives, digital immigrants. *On The Horizon*, 9(5) [Online]. Available: http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Sivapalan, S. and Wan Fatimah, W.A. (2010) A Web-Based Multimedia Approach to Literature in Malaysian Secondary Schools: Learners' Preferences. *European Journal of Social Sciences* [Online], *12*(3). Available: http://www.eurojournals.com/ejss_12_3_01.pdf

Shroff, R. H., Deneen, C. D. & Ng, E. M. W. (2011). Analysis of the technology acceptance model in examining students' behavioural intention to use an e-portfolio system. *Australasian Journal of Educational Technology*, 27(4), 600-618.

Suraya H. (2005). A Framework for Strategis Future E-Learning Applications to Supposrt Sustainable Growth in the E-Learning Industry. In *Proceedings of the International Conference on Multimedia and ICTs in Education (m-ICTE2005)*, June 7-10, 2005, Caceres, Spain,1-10.

Svensson, L., & Östlund, C. (2007). Framing Work-Integrated e-Learning with Techno-Pedagogical Genres. *Educational Technology & Society*, *10*(4), 39-48.

Vallance, M. (2008). Beyond policy: Strategic actions to support ICT integration in Japanese schools. *Australasian Journal of Educational Technology* [Online], *24*(3), 275-293.

Yap, W.L., Neo, M. & Neo, T.K. (2013). Impact of Learner-Centred Teaching Environment with the Use of Multimedia-mediated Learning Modules in Improving Learning Experience. *Jurnal Teknologi*, Vol 64(2), 65-71.

The Effect of Corpus-based Activities on Verb-Noun Collocations in EFL Classes

Serpil UÇAR
Osmaniye Korkut Ata University, Turkey

Ceyhun YÜKSELİR
Osmaniye Korkut Ata University, Turkey

ABSTRACT
This current study sought to reveal the impacts of corpus-based activities on verb-noun collocation learning in EFL classes. This study was carried out on two groups – experimental and control groups- each of which consists of 15 students. The students were preparatory class students at School of Foreign Languages, Osmaniye Korkut Ata University. Before the treatment, a pretest was administered to both groups. The results of the pre-test demonstrated that there was not significant difference between the control and the experimental group. Throughout the study, the experimental group was taught verb-noun collocation through corpus-based materials taken from COCA, and the control group was taught through a conventional method. The results demonstrated that there is a statistically significant difference between experimental and control group in terms of the type of treatment, which signifies that corpus-based activities has a significant impact on verb-noun collocations in EFL classes.

Keywords: verb-noun collocations, corpus-based materials, concordancing lines

INTRODUCTION

Vocabulary plays a vital role in foreign language learning. Nation claims that "words are the building blocks of a language since they label objects, actions, ideas without which people can not convey the intended meaning." (as cited in Zahedi and Abdi, 2012, p.2273). Wilkins (1992, p.111) claims that "little can be conveyed without grammar but nothing can be conveyed without vocabulary."

Vocabulary knowledge consists considerably more than just knowing the word isolation; it also consists knowing the words that tend to co-occur with it. These patterns are called collocations. (Celce Murcia, 2001, p.262). Collocation refers to "the regular co-occurence of words within a given span demonstrating a statistical strength of co-occurence." (Webb, Newton and Chang, 2013, p. 92). Lewis stated that "language consists not of traditional grammar and vocabulary, but often of multi-word prefabricated chunks." (as cited in Rahimi and Momeni, 2012, p.38). Therefore, collocations are an indispensable part of vocabulary knowledge in foreign language contexts.

There are a variety of techniques to teach vocabulary and collocations as collocation teaching has been a highly problematic area for foreign language learners. Among a great many of approaches, Sinclair stated that corpus-based materials are the newest and the most informative since a huge amount of data can be analysed quickly through a corpus (as cited in Binkai, 2012, p.131). Among the researches related to corpus-based activities on teaching vocabulary, Binkai (2012) concentrated on the vocabulary learning in English through corpus-based contexts. The study discussed the usage of corpus in teaching and learning vocabulary.

The findings demonstrated that corpus-based method is benefical for vocabulary learning and can enhance the learning autonomously concurrently. Another research conducted by Chao (2010) investigated whether corpus-based activities have an effect on high school students' collocation learning. The results demonstrated that corpus-based activities are helpful in learning collocations.

However, there are highly limited studies conducted concerning the impact of corpus-based activities on collocation teaching in EFL context. This current study was intended to investigate whether corpus-based activities have an effect on teaching verb-noun collocations in EFL classes.

LITERATURE REVIEW

A few empirical studies were conducted about dealing with the issue of how collocations could be most effectively acquired in foreign language learning context. Among the researches conducted, Sun and Wang (2003) investigated the impact of inductive and deductive approaches in order to learn grammatical collocations through concordancer programme on Taiwenese senior high school students. The researchers divided the learners into two groups; deductive and inductive groups. The deductive group was given rule explanations with

examples, on the other hand, the inductive group was required to infer the patterns by the help of concordances. The findings demonstrated that inductive learning of collocation with concordances were more effective than deductive learning.

Another study conducted by Chan and Liou (2005) focused on collocation learning through Web-based concordancing. The results demonstrated that explicit online instruction was found to have an effect on increasing EFL learners' collocation knowledge via concordances. Moreover, another study conducted by Jaeforpour and Koosha (2006) aimed to find out whether concordancing materials through data-driven learning (DDL) have an impact on teaching collocations of prepostitions. The first group had a traditional treatment, on the other hand, the second group had a treatment through DDL supported by concordancing lines. The results showed that concordancing lines through DDL was highly effective in teaching collocations.

Additionally, Chujo, Utiyama and Miura (2006) conducted a study in order to investigate the impact of Japanese- English bilingual corpora on beginner level learners' vocabulary development. The findings displayed that even lower level learners were able to use the corcondancing tool for learning vocabulary. In another study, Moreover, a study conducted by Varley (2009) indicated that students had a positive attitude towards making use of corpus in the field of vocabulary acquisition and noticing syntactical patterns. The results showed that learners were also willing to use the concordancing tool in the future. In another study, Binkai (2012) investigated to find out whether the usage of corpus-based model for vocabulary learning has an effect on learners autonomy of Chinese EFL students. The empirical study showed that concordancing lines were found to be a great help in understanding collocation, colligation and prosody of the search word. According to the findings, the corpus-based study is beneficial for vocabulary acquisition and can contribute to self-governing learning.

In light of these researches, the current study aimed to examine whether the corpus-based activities have an effect on teaching adjective-noun collocations in EFL context. The study tried to answer the research question below:

1. Is there a difference between the verb-noun collocation competence of EFL students who received the instruction through corpus-based activities and those who received the traditional teaching method?

METHODOLOGY

This current research aimed at determining whether corpus-based activities have an effect on collocation teaching in EFL classes. Therefore, this study examined the difference between experimental group taught collocations through corpus-based activities and the control group taught collocations through traditional method. In this part, the participants, the instruments and data collection procedure were discussed in detail.

Participants

The research was conducted with 30 preparatory class students at Osmaniye Korkut Ata University, School of Foreign Languages. The students were majoring in different departments such as the department of Turkish language and literature, business administration, electrical and electronical engineering, food engineering, civil engineering, energy systems and chemical engineering. As this study was conducted in the second term, after taking a proficiency exam about their language level at the beginning of the second term, it was determined that students were on the level of pre-intermediate level. The study was supervised by the researcher herself on prep A (experimental group) and prep C (control group). The experimental group was made up of 15 students and and the control group was also 15 students. The ages of the participants ranged from 19 and 24.

Data Collection Instruments

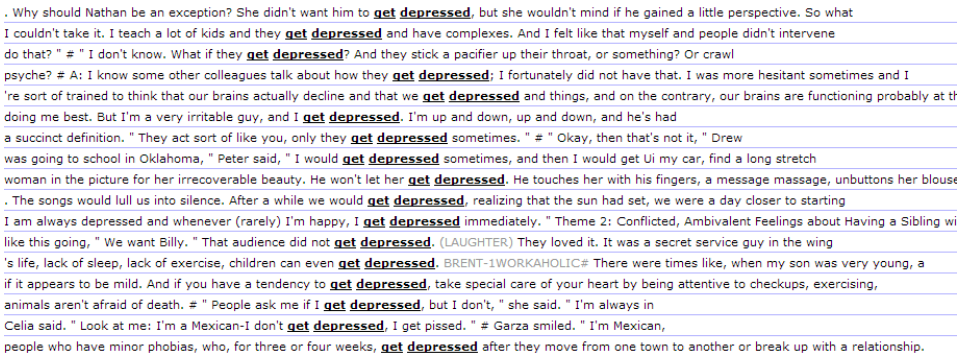
In this current study, 15 collocations were taken from students' maincourse book called "Speak Out Intermediate" published by Pearson were verb-noun collocations.

The " collocation test" designed by the researcher herself was used as a pre-test before the treatment. Then students went under treatment and were given the same test as a post-test. 15 questions in the form of multiple choice were prepared including target collocations in order to measure the collocation competence (recognition) of students. The instrument was checked by the three proficient EFL instructors and piloted to a group of preparatory class students including 20 students for validity and reliability.(reliability, .608)

The materials used in this present study were also corpus-based activities, concordance lines, and a corpus of COCA.

Procedure

The experiment was conducted at School of Foreign Languages in Osmaniye Korkut Ata University at the end of second term of 2013-2014 academic year. The participants were randomly classified into two groups: experimental and control groups. The pre-test (collocation test) was applied to both of the groups by the researcher in May (Appendix A). During the procedure, the 15 target collocations which were chosen from students' maincourse book, 'Speak Out Intermediate', were taught in the experimental group by the help of corpus-based activities. The instructor made use of concordance lines taken from the corpus COCA to teach collocations and designed by herself some exercises for students to practise from the sentences in the concordance lines.(Appendix B, C). Additionally printed worksheets of verb-noun collocations were given subjects as follows:


. Why should Nathan be an exception? She didn't want him to **get depressed**, but she wouldn't mind if he gained a little perspective. So what
I couldn't take it. I teach a lot of kids and they **get depressed** and have complexes. And I felt like that myself and people didn't intervene
do that? " # " I don't know. What if they **get depressed**? And they stick a pacifier up their throat, or something? Or crawl
psyche? # A: I know some other colleagues talk about how they **get depressed**; I fortunately did not have that. I was more hesitant sometimes and I
're sort of trained to think that our brains actually decline and that we **get depressed** and things, and on the contrary, our brains are functioning probably at th
doing me best. But I'm a very irritable guy, and I **get depressed**. I'm up and down, up and down, and he's had
a succinct definition. " They act sort of like you, only they **get depressed** sometimes. " # " Okay, then that's not it, " Drew
was going to school in Oklahoma, " Peter said, " I would **get depressed** sometimes, and then I would get Ui my car, find a long stretch
woman in the picture for her irrecoverable beauty. He won't let her **get depressed**. He touches her with his fingers, a message massage, unbuttons her blouse
. The songs would lull us into silence. After a while we would **get depressed**, realizing that the sun had set, we were a day closer to starting
I am always depressed and whenever (rarely) I'm happy, I **get depressed** immediately. " Theme 2: Conflicted, Ambivalent Feelings about Having a Sibling wi
like this going, " We want Billy. " That audience did not **get depressed**. (LAUGHTER) They loved it. It was a secret service guy in the wing
's life, lack of sleep, lack of exercise, children can even **get depressed**. BRENT-1WORKAHOLIC# There were times like, when my son was very young, a
if it appears to be mild. And if you have a tendency to **get depressed**, take special care of your heart by being attentive to checkups, exercising,
animals aren't afraid of death. # " People ask me if I **get depressed**, but I don't, " she said. " I'm always in
Celia said. " Look at me: I'm a Mexican-I don't **get depressed**, I get pissed. " # Garza smiled. " I'm Mexican,
people who have minor phobias, who, for three or four weeks, **get depressed** after they move from one town to another or break up with a relationship.

Neverthless, because of the time constraints, only two two-hour sessions of treatment were possible. On the other hand, in the control group, target collocations were taught explicitly through dictionary meanings and exercises taken from students' coursebook.(Appendix D) After the procedure, the collocation test was also used as a post-test administered to both groups. It provided as a basis for the results of experimental group.

Data Analysis

The results gathered from the pre-test and post-test were analyzed using SPSS (Statistical Package for Social Sciences), version 16.0. An Independent t-test was applied in order to see whether there was a statistically significant difference or not between the experimental group and the control group. Additionally, a Paired Sample t-test was used so as to compare differences within each group.

DATA ANALYSIS

Concerning the research question, the current study was intended to investigate whether the corpus-based activities (concordancing materials) have an effect on teaching verb-noun collocations (V-N) of EFL students. This study was conducted in order to investigate the difference between the experimental group taught collocations through corpus-based activities (concordancing materials) and the control group taught collocations through traditional method. (dictionary meaning and exercises from students' coursebook)

Comparison of pre-test scores, experimental and control groups

An independent sample t-test was conducted in order to investigate the difference between the control group and the experimental group in terms of students' awareness of collocation at the beginning of the research. Table 1. demonstrates the results of independent sample t-test analysis for pre-test scores of experimental and control groups.

Table 1. Independent Sample T-test Analysis for Pre-test Scores of Experimental and Control Groups

			t-test for Equality of Means						
	M	**SD**	**t**	**df**	**p**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
Control group	30,80	15,893	-,199	28	**,844**	-1,067	5,360	-12,045	9,912
Experimental Group	31,87	13,352							

Table 1 demonstrated that the findings produced non-significant results, To be more specific, there is not a statistically significant difference between the experimental group and the control group with regard to the pre-test scores of students awarenes of collocation in the control and experiment groups at the beginning of the study. *(t* (28)= -.199, *p*=.844). Therefore, it is concluded that the participants in each group were equal with respect to their collocation competence at the beginning of the study.

Comparison of pre-test, post-test scores, experimental group

A paired-sample t-test was also conducted to compare the mean scores of pre-test and post-test of collocation test for both control group and experimental group in order to find out whether corpus based activities are helpful in developing students' collocation learning or not. Table 2 shows that the results of paired-samples t-test analysis for the experimental group below:

Table 2. Paired sample t-test analysis for pre-test and post-test scores of Experimental group

	N	M	SD	T	df	p
The pre test overall scores	15	31.87	13.352	-4.481	14	.001
The post-test overall scores	15	65.93	20.126			

According to Table 2, the findings indicated that there is a statistically significant difference between pre-test (*M*= 31.87, *SD*= 65.93) and post-test (*M*=65.93, *SD*=20.126) scores of experimental group with regard to collocation test scores. (*t* (14)= -4.481, p<.005). Therefore, it can be said that the instruction through corpus-based activities (concordancing) were found to be significantly affecting students' learning verb-noun (V-N) collocations in the current study.

Comparison of pre-test, post-test scores, Control group

Table 3 demonstrates the results of paired sample t-test analysis for the pre-test and post test scores of the control group below:

Table 3. Paired samples t-test analysis for pre-test and post-test scores of Control Group

	N	M	SD	Df	t	p
The pre-test overall scores	15	30.80	15.893	14	-1.946	.072
The post-test overall scores	15	41.20	15.608			

As Table 3 indicates, the findings yielded to non-significant results. To be more specific, there is not a statistically significant difference between collocation pre-test (*M*=30.80, *SD*=15.893) and post-test (*M*=41.20, *SD*=)15.608) scores of control group in terms of verb-noun collocation learning. (*t* (14)=-1.946, *p*=.072). It can be concluded that the conventional instruction was found not to have a significant effect on verb-noun collocation learning although there was an increase from the mean scores of pre-test overall scores to the post-test scores in the control group.

Comparison of post-test scores, experimental and control groups

An independent sample t-test was performed in order to compare the post-test mean scores of two groups (control and experimental groups) to investigate whether there was a
significant difference between these groups regarding to the type of the treatment. Table 4 shows the results of the difference between the groups below:

Table 4. Independent sample t-test analysis for the difference between the post test scores of the groups

			Levene's Test for Equality of Variances			t-test for Equality of Means			
	M	SD	t	df	p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Control group	41.20	15.608							
			-3,761	28	**,001**	24,733	6,576	-38,204	-11,263
Experimental group	65.93	20.126							

Table 4 indicated that there is a statistically significant difference between the collocation post test scores of control group (M=41.20, SD=15.608) and experimental group (M=65.93, SD=20.126) with respect to the type of the treatment. (t (28)=-3.761, p<0.05). Therefore, it can be concluded that those who received instruction through corpus-based activities showed significantly higher performance in the collocation test to those who received instruction in the conventional approach.

DISCUSSION AND CONCLUSION

This present study was intended to examine the difference between experimental group taught verb-noun collocation through corpus-based activities (concordancing materials taken from COCA as the concordancing) and the control group taught verb-noun collocations through a traditional method based on dictionary meanings and activities taken from students' coursebooks. The quantative data were gathered from students' pre-tests and post-tests which were administered respectively. The participants in each group were similar in terms of their collocation competence before the treatment. After the treatment, the post-test was administered to students in order to determine the impact of corpus-based instruction the participants received. The findings have demonstrated that the instruction through corpus-based activities (concordancing) were found to be significantly affecting students' learning verb-noun (V-N) collocations in the current study. Therefore, students who received instruction through corpus-based activities showed significantly higher performance in the recognition of collocation test to those who received instruction in the traditional method.

The results obtained from this current study is consistent with the previous researches that have found the impact of corpus-based studies on collocation teaching over the traditional method. (Sun and Wang, 2003; Chan and Liou, 2005; Jaeforpour and Koosha, 2006; Chujo, Utiyama and Miura, 2006; Liu and Jiang, 2009; Le, 2010; Binkai, 2012, Jafarpour, Hashemian and Alipour, 2013). All of these researchers have investigated to determine the effectiveness of corpus-based studies on vocabulary and collocation development in the last decades.

Jafarpour, Hashemian and Alipour (2013) conducted a study in order to compare the impacts of the corpus-based studies over the conventional method. The findings demonstrated that the instruction based on corpus-based method has positive effects on the experimental group with respect to comprehension and production of collocations. Chan and Liou (2005) also investigated the effectiveness of making use of web-based concordancing on English verb-noun collocations by the help of a web-based Chinese-English bilingual concordancer. The results indicated that learners improved their collocations significantly after the treatment in the study. Another research was the one carried out by Jafarpour and Koosha, (2006), examining the impact of corpus on teaching collocations of prepositions. The result showed that concordancing lines through DDL was beneficial in improving collocations of prepositions. Sun and Wang (2003) investigated the effect of concordancer programme to learn grammatical collocations, verb+preposition collocations. The findings showed that concordancing was effective in collocations learning.

Therefore, all these studies are line with the results gathered from the current study and concerning the findings, this empirical study proved that students' overall verb+noun collocation competence was improved significantly by the help of the corpus-based studies which provides a variety of authentic examples taken from the corpus.

Implications of the Study

Collocations are an indispensable part of vocabulary knowledge in foreign language contexts. The findings of the current study suggest language teachers practical clues and insights so as to manage EFL students' problems in learning collocations. Language teachers can make use of corpus based materials and introduces these activities in printed worksheets to foreign language students in order to make students more eager integrating the corpus into English language teaching.

It is also crucial for material developers and curriculum designers as they can design materials integrating corncordancing programs and corpus-based activities in language programs in order to promote language learning, especially vocabulary learning.

Suggestions for Further Research

This study provides two suggestions for further studies in the field of collocation learning. First of all, future researches could focus on the impact of other types of collocation patterns of language such as grammatical collocations like verb+preposition collocations or lexical collocations like adjective+noun collocations or teaching other skills (grammar points, writing etc.). Furthermore, as this study was conducted with pre-intermediate level EFL students, future researches could concentrate on the effectiveness of corpus-based activities on more proficient level students from different backgrounds (students learning English as a second

language or for academic purposes) in order to examine whether there would be the same results for students from different backgrounds.

Limitations of the Study

This current study was limited in the following two ways. The first one was the small size of the participants; only thirty students (15 for control group; 15 for experimental group) participated in the study. More participants might have been generalizable to the population. Another limitation was that the treatment was made up of two two-hour sessions to teach verb+noun collocations due to the time constraints. More sessions might have revealed more significant results.

REFERENCE

Binkai, J. (2012). An Empirical Study on Corpus-driven English Vocabulary Learning in China. *English Language Teaching*, *5*(4).

Celce-Murcia, M. (2001) *Teaching English As Second or Foreign Language*. Newbury House

Chan, T. P., & Liou, H. C. (2005). Effects of web-based concordancing instruction on EFL students' learning of verb–noun collocations. *Computer Assisted Language Learning*, *18*(3), 231-251.

Chao, P. (2010). A study of collocation learning of junior high students in Taiwan via concordance. Paper presented at the 2010 international conference on English teaching, Kaohsiung, Taiwan. Retrieved 14.02.2011, from http://www2.kuas.edu.tw/edu/afl/20100430Final/Word/2010comp_EPCA.pdf

Chujo, K., Utiyama, M., & Miura, S. (2006). Using a Japanese-English parallel corpus for teaching English vocabulary to beginning-level students. *English Corpus Studies*, *13*, 153-172.

Conrad, S. M. (1999). The importance of corpus-based research for language teachers. *System*, *27*(1), 1-18.

Jafarpour, A.A., Hashemian, M. & Alipour, S. (2013). A corpus-based Approach toward teaching collocation of synonyms. *Theory and Practice in Language Studies*, *3 (*1), 51-60

Jafarpour, A. A. & Koosha, M., (2006). Data-driven learning and teaching collocation of prepositions: The case of Iranian EFL adult learners. *Asian EFL journal*, *8*(4), 192-209

Le, T. H. (2010). Learning lexical collocations with concordancing and scaffolding. Unpublished master's thesis, University of Groningen

Liu, D., & Jiang, P. (2009). Using a Corpus-Based Lexicogrammatical Approach to Grammar Instruction in EFL and ESL Contexts. *The Modern Language Journal*, *93*(1), 61-78.

Rahimi, M., & Momeni, G. (2012). The effect of teaching collocations on English language proficiency. *Procedia-Social and Behavioral Sciences*, *31*, 37-42.

Sun, Y. C., & Wang, L. Y. (2003). Concordancers in the EFL classroom: Cognitive approaches and collocation difficulty. *Computer Assisted Language Learning*, *16*(1), 83-94.

Varley, S. (2009). I'll just look that up in the concordancer: integrating corpus consultation into the language learning environment. *Computer Assisted Language Learning*, *22*(2), 133-152.

Webb, S., Newton, J., & Chang, A. (2013). Incidental learning of collocation. *Language Learning*, *63*(1), 91-120.

Wilkins, D.A. (1992). *Second- Language Learning and Teaching*. Great Britain: The Chaucer Press.

Zahedi, Y. & Abdi, M.(2012). The impact of imagery strategy on EFL learners'vocabulary learning. *SciVerse Science Direct, 69* (2012), 2264-2272.

APPENDIXES

Appendix A

Collocation Test (as pre-test and post-test)

1. My hope is to find a new home for Lucifer, but that will _____ some time to get it.

   a. get b.take c.make d.have

2. Men and women who want freedom and growth should _____ action immediately.
   a. make b.go c.come d.take

3. Every American president in the last 30 years has tried to _____a deal with Iran.
   a. have b.see c.make d.get

4. Disease Control and Prevention report that more than 200.000 Americans _____ food poisoning every single day.
   a.get b.have c.do d.make

5. If the boss wanted to see him, he was probably going to _____ fired.
   a. go b.get c.come d.take

6. When people stand behind their decisions, they are going to _____responsibility for them.
   a.be b.decide c.take d.make

7. If people stare at the sun long enough, they will _____blind because our eyes are very sensitive.
   a.get b.have c.take d.go

8. If you start to get too many things in your head, you will _____crazy.
   a.have b.make c.go d.take

9. People can _____a donation to help poor people. No matter how small, even ten dollars can be enough for them.
   a.give b.make c.take d.do

10. Heavy smokers lose their health. The are more likely to _____a disease of lung cancer in the future.
    a.give b.have c.make d.decide

11. I couldn't hear what he said. He was so distant from me. So, I needed to _____closer to hear him better.
    a.give b.do c.come d.make

12. One of the male respondents described it as " the power to _____orders. " A woman explained it more fully: " Power can be to order.
    a. see b.give c.do d.make

13. There are a lot of different reasons why kids might _____depressed, so depressed that they're willing to kill themselves.
    a. go b.have c.get d.make

14. You have to make a living and if you're smart you can _____ a fortune in a short time.
    a.make b.take c.get d.do

15. Politically motivated people in the State Department decided to _____an attempt to find that letter.
    a.do b.give c.make d.decide

Appendix B Screenshots from Concordance Lines

you have to make a living and if you're smart you can **make a fortune**, you know. KILMEADE: Right. GUTTENBERG: And most of the time you're
! # MEDBOURNE: I've just thought of a surefire way to **make a fortune**. I'll supply the East Indies with ice by harnessing a team of whales
admit, and self-doubt had begun to creep in. We didn't **make a fortune** at Donut Hearts on our best days, and there was a fine line between
. The people would get to work on time. The driver would **make a fortune**. The light turned amber. He accelerated, in the same instant pressing
keep it a secret? " asked my brother. " He could **make a fortune**! " # " Only fools think only about money! " said my father
from the recession. Greg Rand, author of Crash Boom!: **Make a Fortune** in Today's Volatile Real Estate Market, indicates that there are five tren
with that money, and, if they pay off, it can **make a fortune** and pay big bonuses? SIMON-JOHNSON: Yes, absolutely, make money, get
penchant for pulchritude has gotten him in to trouble before and helped him **make a fortune**. But before we get to that it helps to know about his
carbon dioxide, and they'd ban alcohol too if they didn't **make a fortune** in tax revenue on Yoobie beer. Not only have they failed to solve proble
Gold Rush, " she'd said, " die real way to **make a fortune** was in farming. And unless they're planning to ship food out here forever
, Arabic, or anything else. It was telling me how to **make a fortune** investing in foreclosed properties. Not sometiiing a serape-draped sentry wou
map, Atkin says, maybe add population data, and you could **make a fortune**. He himself has just returned from Ukraine, and Bidwells has been
running red lights, making illegal turns, etc. The city would **make a fortune**. # If I were king, I would enact the following rules: Eliminate
up in the Sierra Nevada. Her customers are rough miners trying to **make a fortune**. They are all in love with her, and each believes he is the
each device. But most company watchers think that Bezos is positioned to **make a fortune** on the device. Barclays Capital predicts Kindle device
one-time New York Times reporter who left journalism in the early 1980s to **make a fortune** on Wall Street. # He also emerged as a champion p
would ever have dreamed that in antebellum America, a black man could **make a fortune** as a ventriloquist and a magician. These people - Alice

5. SIIAkI-VLIX; # No matter your mode of transportation, **make an attempt** to walk around for five to 10 minutes every two hou
I am not going to be interested in a man that doesn't **make an attempt** to -- I know this sounds terrible. KOTB: Right. Say it.
they knew how he slaved over each sentence? Would they at least **make an attempt** to keep from falling asleep? # You couldn't lis
Director in all department meetings, emails, and other communications. We **make an attempt** to touch base with each other daily.
eclipsed by the headlines. But even so, it was necessary to **make an attempt**. And not merely (now I understand) because of my
Macy's bag that he' s come to make a return. **Make an attempt**, that is. " Hello, Evelyn, " says Harry Ibis in his
delinquents in the AGKCIK. The primary goal of these activities is to **make an attempt** for the decarceration of the young delinque
over, you know, the George Washington Bridge and was going to **make an attempt** to land in the water. VAN-SUSTEREN: Well, pla
We decided that I would move up closer to Gainesville and we would **make an attempt** at a more serious, stable, committed relati
We have been here five days now. And, every time we **make an attempt** to call the president's office, we're given one excuse or a
. That everybody should speak English. But that we're gon na **make an attempt** to speak their language, as well. TERRY-MORAN-1
that's not what's going to happen. They are going to **make an attempt** somebody who might have run guns or sheltered a terrorist
to predict the Final Four and the champions? SULLIVAN: I'm **make an attempt** here, but I think Yukon is the most talented team in
the Oval Office, to make one last pass at getting Bush to **make an attempt** at true diplomacy in the Middle East. # Bush may have
a friend? Whatever Matt expected, Cahill could not bring himself to **make an attempt** to contact him-at least, not at this point in tim
. And as we zip up our flies, Harris and I barely **make an attempt** to see him. " That's my point, " I whisper to Harris
in that some of the spyware is incredibly sophisticated. And you'll **make an attempt** to delete it, it may look like it's gone, it may c
the ball might drop that Walker decided he must tag from third and **make an attempt** to score. It was a desperate decision. Ramir

Appendix C Exercises taken from Concordance Lines

Cloze Activity

Fill in the gaps with the correct verb collocating higlighted nouns.

1. I am always depressed and whenever (rarely) I'm happy, I_____ depressed immediately.
2. I'm scared. I'm scared I'm going to _____ fired.
3. The people would get to work on time. The driver would _____ a fortune.
4. My eyes _____ blind in the salty surf.
5. But it's your responsibility to _____ action to do that.

Spot the Error Activity

Spot the error in highlighted collocations

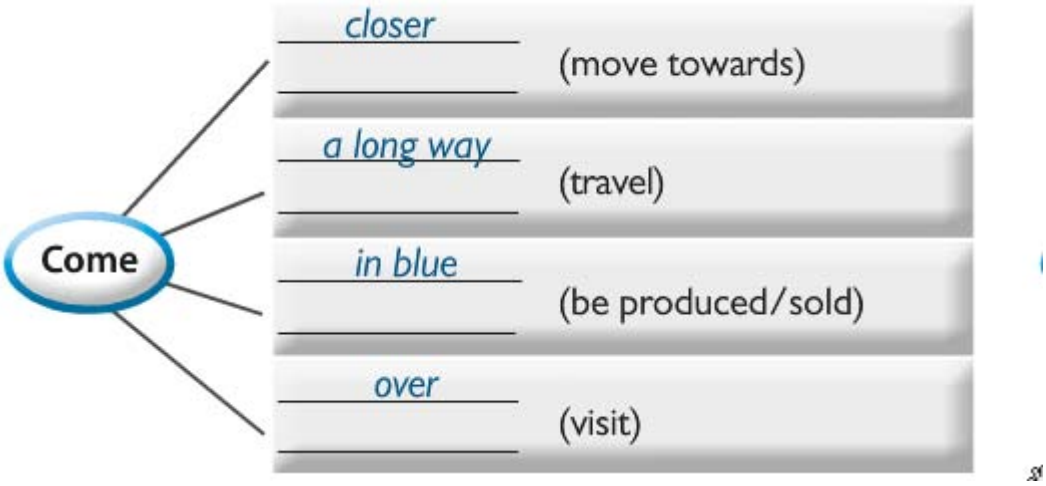
1. She actually went to a place where he would have food poisoning on purpose
2. We have been here five days now. And, every time we do an attempt to call the president's Office
3. If I did it, he would do crazy
4. The referee's job to make the call and the coach's job to say orders.
5. If you pay a donation and I give you stamps.

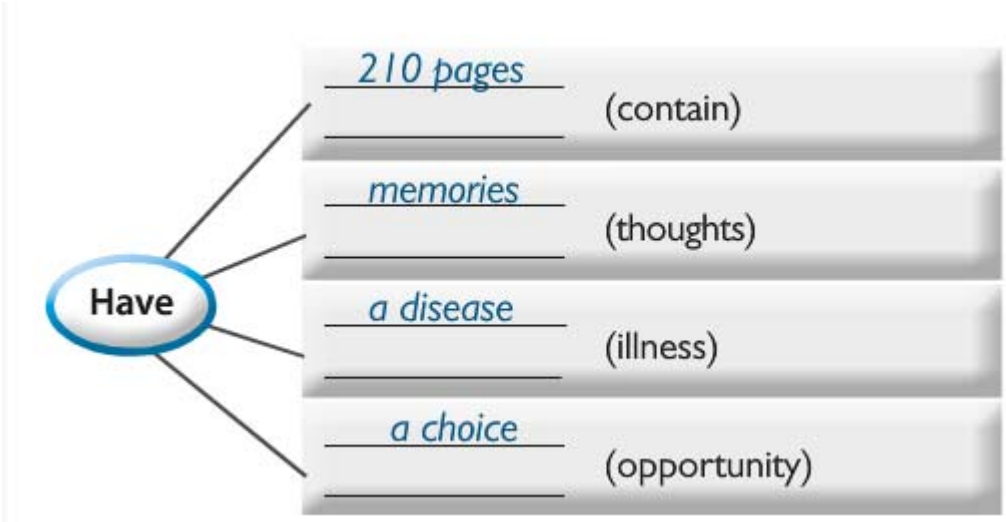
Multiple Choice Test

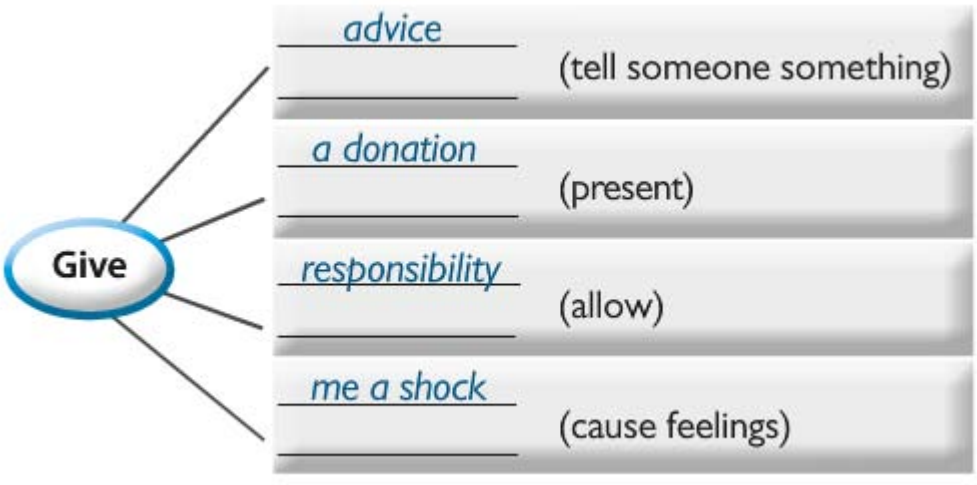
Choose the correct answer.

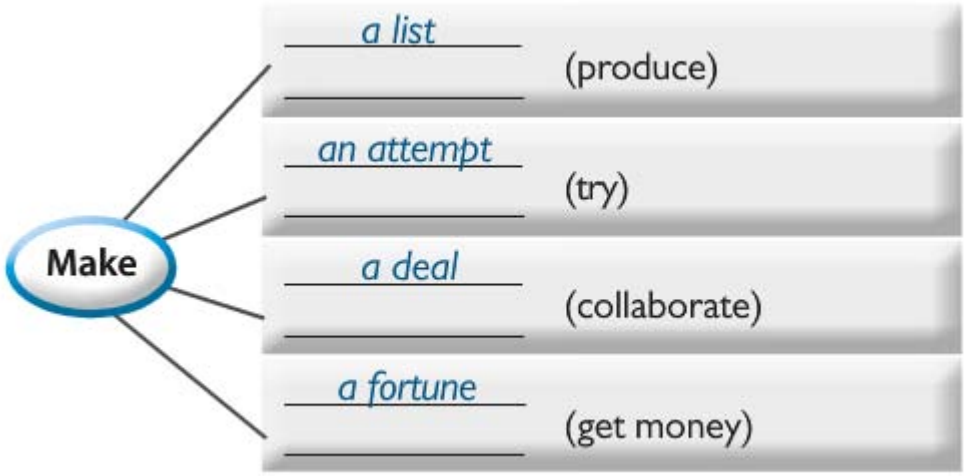
1. But in fact, we _____ a disease treatment system more than a health care system these days.
   a. get b. do c.have
2. Did you _____ a deal with him?
   a. make b.have c.do
3. I could _____ some time off. I could do some movies.
   a. Have b.take c.do
4. We _____ responsibility for our actions; we do our best in everything.
   a. Take b.sign c.be
5. we see a little boy start to approach , _____ closer and closer, gets involved in a conversation.
   a. approach b.see c.come

Appendix D **Exercises taken from Coursebook**









The Impacts of Workplace Advantage, Learning Intentions, and Technology Skills on the Use of Information Technology-Assisted Instruction by Early Childhood Pre-Service Teachers

Professor Ru-Si Chen
Department of Child Care and Education, Yu Da University of Science and Technology
chenrs@ydu.edu.tw

ABSTRACT
The practical value and usefulness of IT-assisted instruction for Taiwanese preschool children are popular topics in academic and practical settings. The purpose of this study was to survey early childhood pre-service teachers' attitudes regarding the workplace advantage of IT-related pedagogy and their learning intentions regarding IT-based applications for teacher education in Taiwan. The researcher used a survey to collect data, and analyzed the data through structural equation modeling. The value obtained for the model fitness indices using the confirmatory factor analysis indicated that the measurement model demonstrated an acceptable level of fitness. The results demonstrate positive relationships among the hypotheses for pre-service teachers' attitudes regarding preschool infrastructure, workplace advantage, and utility value. The findings revealed that pre-service teachers consider IT-assisted instruction to be a useful tool for enhancing their teaching knowledge and abilities. Their perceptions of IT-related applications as useful positively influenced their learning intentions in IT-related courses in teacher education and their perception of the importance of advancing their technology skills to assist young children in preschool learning. The implications of the findings are also discussed.

INTRODUCTION
The integration of information technology (IT) into teaching and learning activities is an important pedagogical innovation and a practical development for young children. IT-applied instruction helps young children have more learning opportunities, motivates them to learn, increases their interest in learning, and gives them a sense of autonomy in the advancement of their cognitions and skills (Abramovich & Cho, 2009; Ljung-Djarf, 2008). When provided with the ability to access IT applications for assistance during instructional activities, young children acquire more vocabulary, and develop useful language skills (Bittman, Rutherford, Brown, & Unsworth, 2011). Their access to IT significantly correlates with higher performance in the verbal, perceptual-performance, and general cognitive domains (Fish et al., 2008). Interest in the use of IT applied instructions is positively correlated with cognitive and social development in young children. Some preschools in Taiwan have begun to integrate IT-related applications into their teaching practices, constructing user-friendly IT-assisted learning environments, and advancing teachers' technology skills to improve student's learning experiences.

A critical factor for applying IT to instructional development and pedagogical advancement for young children is the attitude of the early childhood teacher regarding the advantages of using IT-related applications in the preschool classroom. The early childhood teachers' experiences with IT during professional development and teacher education influences their perceptions regarding its integration into their pedagogical approach. Their intentions to use IT in their teaching activities also affects their instructional beliefs and practices (Chai, 2010; Wong, Gao, Chai, & Chin, 2011). Most early childhood in-service teachers indicate that IT-related courses in their prior pre-service education did not significantly improve their IT literacy or aid them in developing superior IT-related competencies. Thus, they do not perceive themselves as being competent in basic or advanced applications of IT-related instruction (Goktas, Yildirim, & Yildirim, 2009).

The availability of IT in preschool classroom affects the development of young children's computer skills and the understanding of early childhood pre-service teachers. The workplace experiences of early childhood pre-service teachers encourage their interest in preschool instructional strategies and advancements in classroom activities and constructive learning styles. Their experiences with IT-assisted learning during their teacher education, influences their attitudes regarding the usefulness and the ease of use of IT in both the university context and future work environments (Edmunds, Thorpe, & Conole, 2012; Sackes, Trundle, & Bell, 2011; Sims & Walsh, 2009).

Following other trends in the innovative use of IT, teacher education increasingly uses IT applications to provide pre-service teachers more opportunities for learning and training to advance their level of IT literacy in academic and practical settings (Gomez, Sherin, Griesdorn, & Finn, 2008). Teacher education plays an important role in preparing pre-service teachers with the necessary knowledge and skills to improve their academic, social, and intellectual development through the application of IT. Teacher education also develops pre-service teachers'

pedagogical approaches in the field of preschool teaching, and provides more opportunities for them to learn to work productively with young children (McDonald et al., 2011).

It is generally accepted that there has been an increasing interest in IT-related pedagogical applications as innovative tools in preschool settings. This study focused on early childhood pre-service teachers' perceptions of the advantages of IT-related learning activities in their teacher education and professional development, and explored the relationships between their attitudes toward IT-related teaching activities and their professional literacy. Because of the importance of preschool teaching and learning practices for young children, the researcher addressed these issues by examining the impacts of early childhood pre-service teachers' attitudes toward the workplace advantage associated with the use of IT in the preschool classroom on their learning intentions and expectations with regard to IT-based methods for teacher education.

The relationships between preschool infrastructure, workplace advantage, and utility value are fostered through the use of IT-assisted instruction

The workplace practicum experience provides an opportunity for pre-service teachers to apply the knowledge and skills acquired in teacher education to actual teaching practices. Pre-service teachers consider the relationships between their utility value and outcomes, and reflectively construct their performance to develop effective teaching behaviors (Koc, 2012). Pre-service teachers should develop the ability to apply their learning experiences from training situations to professional teaching situations, transforming their professional knowledge into practical workplace experience, and articulating the training of supervisors and teachers (Chalies, Bruno-Meard, Meard, & Bertone, 2010).

The pre-service teachers' attitudes regarding IT influence their perceptions of field training. The IT provisions within a school's infrastructure help pre-service teachers develop positive attitudes regarding IT self-efficacy, proficiency, and usefulness, and stimulate them to apply IT to their classroom practices (Abu Al-Ruz & Khasawneh, 2011). The pre-service teachers' beliefs regarding the frequency of use of IT also influence their self-efficacy and their ability to integrate IT-assisted instruction into their teaching practices. Teachers' pre-service experiences and beliefs are important predictors of their potential integration of technology in their future classrooms (Anderson, Groulx, & Maninger, 2011; Yildirim, Kececi, & Bulduk, 2011).

Current IT-based pre-school environments provide more opportunities for young children to learn about both subject matter and IT (Sackes, Trundle, & Bell, 2011). With the increasing number of opportunities to access, understand, and use IT both within and outside the preschool classroom, young children develop positive attitudes toward IT, and become more proficient at using IT to learn. Early childhood teachers should recognize the benefits of IT-related applications, and increasingly integrate IT into age-appropriate lessons in preschool classrooms (McKenney & Voogt, 2010).

The early childhood pre-service teachers' beliefs regarding teaching approaches in future workplaces are closely related to their learning experiences in teacher education and their teaching outcomes in preschool, and influence their ability to integrate learning conceptions, approaches, motivations, and competencies for teaching young children through the use of IT-based applications. Their orientations and perceptions of the learning contexts affect their learning motivation, learning styles, and the use of cognitive strategies in teacher education (Chan, 2010; Lyke & Young, 2006).

Teacher education institutions should focus on how the pre-service teachers' thoughts affect their transition between teacher education and the workplace. Educators should provide pre-service teachers with more opportunities to experience the academic, social, and career aspects of teaching, encouraging them to make innovative contributions in teaching practices, and develop their thoughts regarding how the use of IT-related applications may affect their future employment and professional opportunities (Garraway, Volbrecht, Wicht, & Ximba, 2011; Swanson, Broadbridge, & Karatzias, 2006). Teacher educators should provide them with occupational specific courses that engage them in authentic instances of workplace practices to help them transition more smoothly into the workplace (Billett, 2009). Teacher education should also supply them with some useful means to prepare them for professional development, and facilitate the accumulation of their work experiences and job-related knowledge (Santiago, 2009).

According to the results of previous studies, early childhood pre-service teachers' perceptions of the ability of a preschool's infrastructure to support IT-related pedagogical applications corresponds with their beliefs regarding the workplace advantage associated with the integration of IT into their teaching practices. Their perceptions of the advantages of IT-related pedagogical applications in assisting young children's cognitive and academic performances also affect their utility value of IT-related courses in teacher education. Because of the relationship

between their attitudes regarding preschool infrastructure and their perceptions regarding the workplace advantage associated with using IT, early childhood pre-service teachers' learning intentions in IT-related courses in teacher education are influenced by their perception of the workplace advantage. Thus, the researcher proposes the following hypotheses:

Hypothesis 1: Preschool infrastructure positively influences workplace advantage.
Hypothesis 2: Preschool infrastructure positively influences utility value.
Hypothesis 3: Workplace advantage positively influences utility value.

The relationships between utility value, learning intentions, and technology skills are fostered through the use of IT-assisted instruction

The accessing, supporting, and modeling of IT use in the classroom can help pre-service teachers to improve their performance using IT, and help them to develop positive attitudes toward IT-assisted teaching and learning (Hammond et al., 2009; Nikolopoulou & Gialamas, 2009). The intrinsic and extrinsic motivations of pre-service teachers also affect their attitudes toward the use of technology, such as the integration of IT and its role in the classroom (Cullen & Greene, 2011; Sahin, 2011). Pre-service teachers' perceptions regarding self-efficacy and the usefulness of IT influence their intentions to use IT in educational contexts (Luan & Teo, 2009; Teo, Ursavas, & Bahcekapili, 2012; Teo, 2009).

Teaching approaches and course objectives also influence pre-service teachers' attitudes toward the use of IT for learning in teacher education. Pre-service teachers use IT as a tool to advance their academic performance and improve their affective engagement in learning. Their learning cognitions appear to conform to the lecturers' instructions, and are maintained by the continued use of IT during their teaching careers (Hammond, Reynolds, & Ingram, 2011; Margaryan, Littlejohn, & Vojt, 2011). Lesson planning in teacher education helps them develop professional competence in effective classroom management, and acquire relevant knowledge of pedagogical content, which allows them to make reasonable pedagogical choices to scaffold the instructional constructions (Rusznyak & Walton, 2011).

Pre-service teachers' perceptions of program experiences influence their pedagogical dispositions and teaching practices (Kidd, Sanchez, & Thorp, 2008). Teacher educators should identify pre-service teachers' learning styles, and provide training or experiential courses to improve their personal and professional knowledge (Petersen, 2007). Teacher educators must learn to design instructions and scaffold authentic experiences to integrate IT into teacher education. Pre-service teacher education should provide the necessary institutional support to help teachers develop competencies in planning, leadership, and cooperation (Tondeur et al., 2012).

For early childhood teachers, previous studies have indicated that pre-service teachers' confidence level and competency in the use of technology influences their pedagogical beliefs regarding the use of IT in the classroom (Gao, Chee, Wang, Wong, & Choy, 2011; Gao, Choy, Wong, & Wu, 2009; So & Kim, 2009). Pre-service teachers have a theoretical understanding of the pedagogical knowledge of the integration of IT competency and teaching performance, but they often feel challenged in the use of IT-related tools and resources for the development of instructional designs and relevant activities. Pre-service teachers need more knowledge, guidance, and modeling to enable them to develop effective skills and pedagogical practices using IT-related techniques by advancing their technology skills.

The early childhood teachers' intentions to apply IT-based teaching activities can determine their instructional planning, designing, practicing, and evaluating directions and developments. Teacher education programs should provide more opportunities for pre-service teachers to use IT-based methods, construct pedagogical content, increase their knowledge of pedagogical models, and advance their IT competencies in the use of preschool infrastructure (Abramovich & Cho, 2009). Their beliefs and knowledge regarding pedagogy influence the quality of their professional practices. In addition, the connections between their epistemological beliefs and their pedagogical training during teacher education are very important (Brownlee, Boulton-Lewis, & Berthelsen, 2008; Ljung-Djarf, 2008; Yurdakul, 2011). The uses of IT-related learning activities in teacher education foster pre-service teachers' understanding of IT-based educational learning objectives, and enhance their teaching competencies. The educational courseware and learning materials used in teacher education can provide pre-service teachers with more teaching methods to develop their technology skills (Ma, O'Toole, & Keppell, 2008).

The findings of previous studies have collectively shown that pre-service teachers' utility value of IT-related courses substantially influence their perceptions of the benefits of integrating IT-based techniques into their learning activities in teacher education. Thus, the more positive their intentions are regarding the use of IT to

advance their own learning performance, the more positive their attitudes are regarding the use of IT-assisted pedagogical activities for young children in future workplaces. If they value the use of IT to promote their own academic performance in teacher education, they are likely to have positive intentions regarding the integration of IT-related teaching competencies into their professional development, and support the use of IT-based instructional practices. Therefore, the researcher proposes the following hypotheses:

Hypothesis 4: Utility value positively influence learning intentions.
Hypothesis 5: Utility value positively influence technology skills.
Hypothesis 6: Learning intentions positively influence technology skills.

Study objectives

IT applications have been employed in early childhood education, and teachers have made efforts to use it as a critical pedagogical and administrative tool. IT-applied instruction provides teachers with the means for enhancing pedagogical skills and improving their efficacy and performance. Previous studies have stated that understanding IT-based teaching and learning can assist early childhood pre-service teachers in developing their teaching practices and provides workplace advantages in their future teaching endeavors (McKenney & Voogt, 2010; Sackes, Trundle, & Bell, 2011). These studies have also reported that their preferences regarding the use of IT-based instruction positively influence their expectations of preschool practices that will be integrated IT into learning activities for young children (Gao et al., 2011; Gao, Choy, Wong, & Wu, 2009; So & Kim, 2009). Other studies have shown that IT can provide opportunities and useful benefits for advancing academic performance and social development in teacher education, and can improve teacher preschool-teaching methods (Abramovich & Cho, 2009; Ma, O'Toole, & Keppell, 2008).

As mentioned in this literature review, the needs of early childhood pre-service teachers' perceptions in Taiwan regarding the workplace advantages of IT-rich instruction and their learning attitudes toward IT-related applications have not been studied. In this respect, it is essential for early childhood pre-service teachers to explore in greater depth their attitudes and intentions toward the impact of IT-related applications on their preschool instructional and learning practices and their expectations of pedagogical professional development. In this study, the researcher examined teachers' attitudes regarding the contributions of preschool infrastructure, workplace advantage, utility value, learning intentions, and technology skills to their perceptions of the advantages associated with the integration of IT into their preschool teaching practices.

The researcher developed a questionnaire to survey early childhood pre-service teachers' attitudes in Taiwan regarding their intentions to integrate IT into their professional development and to use IT-based instruction for teaching young children. The data that were collected using the questionnaire were examined using structural equation modeling, and the researcher assessed the quality of the measurement and structural models based on fitness indices. The relationships between the observed variables and the latent constructs were tested by confirmatory factor analysis using the measurement model. The total effects of the hypothesized relationships between the latent constructs in the responses were further explored using the structural model. The research model and the study hypotheses are presented in Figure 1.

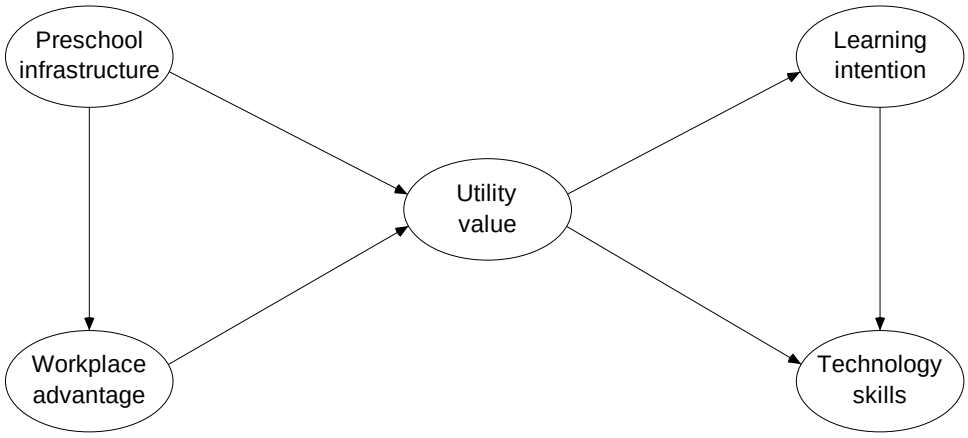


Figure 1: Research model and hypotheses

METHODS

Measurement instrument

The researcher designed a Chinese language questionnaire to assess early childhood pre-service teachers'

attitudes toward IT infrastructure in a preschool environment, the occupational benefits of employing IT in the workplace, their own learning experiences with IT-assisted instructions, and importance of technology skills for teaching young children. According to the review of the literature and the theoretical assumptions, the researcher proposed the following five latent constructs to represent the early childhood pre-service teacher's attitudes regarding the integration of IT-based methods for teacher education: preschool infrastructure, workplace advantage, utility value, learning intention, and technology skills.

The questionnaire addressed the pre-service teachers' knowledge of both IT and early childhood education to assess and correct the observed variables of the latent constructs. The original survey instrument included a total of 18 observed variables that comprised the five latent constructs, with three to four variables contributing to each latent construct. The questionnaire statements were based on a 5-point Likert scale, with 1 indicating strongest disagreement and 5 indicating strongest agreement. The respondent's score on the questionnaire positively correlated with positive thoughts and intentions regarding the integration of IT-based methods into their teaching practices for young children in Taiwan. Detailed descriptions of the five latent constructs are as follows:

1. Preschool infrastructure: assessed the pre-service teachers' attitudes regarding the provisions for the implementation of IT-related pedagogical tools for preschool education in Taiwan.

2. Workplace advantage: assessed the pre-service teachers' perceptions regarding the occupational benefits of the use of IT-assisted teaching methods.

3. Utility value: assessed the pre-service teachers' expectations regarding the benefits of increasing their IT-related knowledge through teacher education.

4. Learning intentions: assessed the pre-service teachers' willingness to learn about applications of IT-assisted instructions in teacher education.

5. Technology skills: assessed pre-service teachers' attitudes regarding the importance of their competency in the use of IT-assisted instruction.

Research design and sample characteristics

During the spring of 2012, the questionnaire was distributed among pre-service teachers teaching various grades and levels of IT competency, who were studying in the early childhood care and education departments at three universities in Northern Taiwan, which were offering 4 years of preschool pre-service teaching education. According to the parameters of the latent constructs and observed variables, the researcher selected an initial sample of 600 completed questionnaires. After excluding questionnaires that lacked responses (total non-responses and item non-responses), the final sample size was 476, with a response rate of 79%. In Taiwan, the early childhood pre-service and in-service teachers are predominantly female. This study sample adequately represented the demographic characteristics of the target population (Table 1).

Table 1: Sample demographics

Respondent characteristic	Number	Percentage
Gender		
Male	3	.6
Female	473	99.4
Grade		
First Grade	96	20.2
Second Grade	119	25.0
Third Grade	128	26.9
Fourth Grade	133	27.9
Numbers of IT devices owned		
1 or None	110	23.1
2	306	64.3
3 and more	60	12.6
Amounts of time spent in IT use per day		
Less than 2 hours	121	25.4
2~4 hours	150	31.5
4~6 hours	85	17.9
Over 6 hours	120	25.2

Data analysis

This study used structural equation modeling to analyze the survey data, and performed a two-stage test of the measurement and structural models (Bollen, 1989; Byrne, 2010; Kline, 2010; Schumacker & Lomax, 2004). In the first stage, the researcher used the Amos 17.0 structural equation modeling program to analyze the measurement model with the raw data as input to assess the fitness of the measurement model by testing the relationship between the latent constructs and the observed variables. The researcher used a maximum likelihood estimation to examine the statistical parameters and model fitness indices in the confirmatory factor analysis. ML is a consistent method for parametric estimation problems and is statistically well founded. ML yields lower variance than other methods do, and tends to be robust regarding numerous assumption violations that occur in confirmatory analysis. Curran, West, and Finch (1996) suggested that ML estimation can be used in confirmatory factor analysis. When sample data have not met multivariate normality assumptions, ML statistics have been proposed as a useful measure for dealing with non-normal data. Based on the estimations of the individual variable factor loadings, statistical significances, and measurement errors, this approach also assessed the extent to which the hypothesized pattern of relationships between the observed variables and the latent constructs were supported by the sample data.

The fitness indices that were used to assess the measurement model were as follows: the chi squared (χ^2) test, the chi squared per degrees of freedom (χ^2/df) test, the root mean square error of approximation (RMSEA), the root mean square residual (RMR), the standardized root mean square residual (SRMR), the comparative fit index (CFI), the normed fit index (NFI), the goodness of fit index (GFI), the Tucker-Lewis index (TLI), and the incremental fit index (IFI). The reliability (alpha) coefficients were used to estimate the reliability of the latent constructs in the measurement model.

In the second stage, path analysis was performed to evaluate the fitness of the structural model based on the path coefficients and the measures of explained variances. The fitness indices for the structural model indicate the degree to which the modeling results were supported the sample data. Examinations of the total effects of the hypothesized relationships between the various latent constructs were used to test the research hypotheses.

FINDINGS

Measurement model

The researcher used confirmatory factor analysis of the measurement modeling of the questionnaire data to evaluate the relationships between the observed variables and theoretical latent constructs. The model fitness statistics for the initial measurement model with 18 items were as follows: $\chi^2 = 432.24$ ($p < .001$), $\chi^2/df = 3.46$, RMSEA = .07, RMR = .05, SRMR = .09, CFI = .93, NFI = .90, GFI = .91, TLI = .91, IFI = .93. The standardized factor loadings for each variable ranged from 0.33 to 0.88. The values of χ^2/df and SRMR confirm that the initial model fit poorly. Based on the results of the factor loadings and model fitness indices for each latent construct, variables with load values greater than 0.50 for the relevant construct were retained, and the fitness indices suggested an acceptable degree of fitness for the sample data. Consequently, the initial 18 observed variables were reduced to 15 variables (Table 2).

Table 2: Retained variables on the questionnaire

Latent construct	No.	Observed variables
Preschool infrastructure	V1	The preschool provides teachers with access of IT.
Preschool infrastructure	V2	The preschool provides teachers with IT-related tools about teaching practices.
Preschool infrastructure	V3	The preschool establishes the teaching environment about IT integrated into instructions.
Workplace advantage	V4	Teachers with IT-applied teaching competence have more employment opportunities.
Workplace advantage	V5	Teachers with IT-applied teaching competence have the higher degree of work efficacy.
Workplace advantage	V6	Teachers with IT-applied teaching competence have the better work performance.
Utility value	V7	Learning IT-related courses could develop my educational professions.
Utility value	V8	Learning IT-related courses could advance my information literacy.
Utility value	V9	Learning IT-related courses could improve my academic performance.
Learning intention	V10	I intend to participate in IT-related pedagogical activities.
Learning intention	V11	I want to learn more knowledge about IT-assisted instructions.
Learning intention	V12	I prefer to use IT to solve learning problems.

Technology skills	V13	I know how to use IT into instructions in preschool.
Technology skills	V14	I know how to design IT integrated into instructions in preschool.
Technology skills	V15	I know how to teach young children via IT-related applications in preschool.

The means of the retained 15 observed variables ranged from 3.15 to 3.84, and the standard deviations ranged from 0.68 to 0.82. The measures of skewness ranged from -0.58 to 0.31, and the kurtosis for these variables ranged from -0.43 to 1.04. The standardized factor loadings for each variable ranged from 0.67 to 0.88, and the measurement errors ranged from 0.22 to 0.55. The researcher also used the bootstrapping method based on 2,000 samples to test the level of significance of the standardized factor loadings. The results showed that the standardized factor loadings for all selected variables had a *p* value less than .01, and the measurements were described by a normal distribution. The researcher used a confirmatory factor analysis based on maximum likelihood estimates to test the parameters of the latent constructs and observed variables.

All the observed variables had positive values for the measurement error variances. The standard errors of the observed variables were less than 1.0. The non-standardized factor loadings of the latent constructs and observed variables were statistically significant ($p < .001$). These statistics show that the measurement model demonstrated an acceptable level of fitness, and conformed to the rules of model identification. All of the theoretical latent constructs reasonably explained the variations of each variable. These results also suggest that the observed variables reflected the descriptions of the theoretical latent constructs.

The researcher used confirmatory factor analysis to evaluate the measurement modeling of the questionnaire data, and assessed the model fitness indices of the sample data. The analysis of the latent constructs based on the measurement model with the standardized parameter estimates are shown in Figure 2. The model fitness statistics for the measurement model were as follows: χ^2=153.25 ($p < .001$), χ^2/df = 1.92, RMSEA = .04, RMR = .02, SRMR = .04, CFI = .98, NFI = .96, GFI = .96, TLI = .97, IFI = .98. The value obtained for the model fitness indices using the confirmatory factor analysis indicated that the measurement model demonstrated an acceptable level of fitness. According to the power analysis of the structural equation modeling based on the RMSEA (MacCallum, Browne & Sugawara, 1996), the statistical power of the model was 1.00, based on null RMSEA values of .05. The reliability (alpha) coefficients for each construct were .79, .85, .87, .82, and .89, with an overall reliability of .88, suggesting that these latent constructs demonstrated satisfactory reliability in assessing early childhood pre-service teacher attitudes toward their learning intentions regarding IT-based instructional applications.

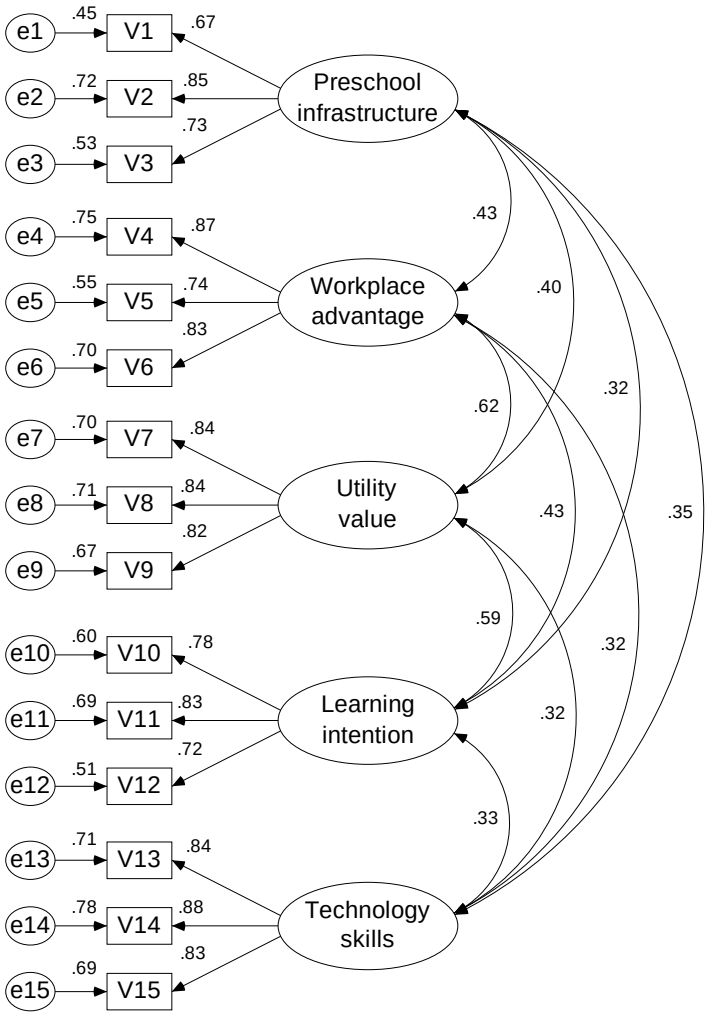


Figure 2: Measurement model

Structural model

Because the estimates of the measurement model indicated reasonable fitness for the sample data, the researcher analyzed the relationships of the structural paths to test the research hypotheses. Figure 3 shows the structural paths of the latent constructs and the path coefficients in structural model of the questionnaire data with the standardized parameter estimates. The following values for the model fitness indices demonstrated an acceptable level of fitness for the sample data: χ^2 = 180.25 (p < .001); χ^2/df = 2.15; RMSEA = .05; RMR = .03; SRMR = .06; CFI = .97; NFI = .95; GFI = .94; TLI = .97; and IFI = .97. Thus, the model fitness statistics provide an acceptable level of support for the structural model.

The standardized regression coefficients, the direct effects, and the measures of explained variance are presented in Figure 3. The latent construct of preschool infrastructure explained 19% of the variance in the latent construct of workplace advantage, with a standardized regression coefficient of .43. The latent constructs of preschool infrastructure and workplace advantage jointly explained 42% of the variance in the latent construct of utility value, with standardized regression coefficients of .18 and .55, respectively. The latent construct of utility value explained 36% of the variance in the construct of learning intentions, with a standardized regression coefficient of .60. The latent constructs of utility value and learning intentions jointly explained 14% of the variance in the latent construct of technology skills, with standardized regression coefficients of .23 and .19, respectively. The p values of the latent constructs were less than .05, indicating statistical significance.

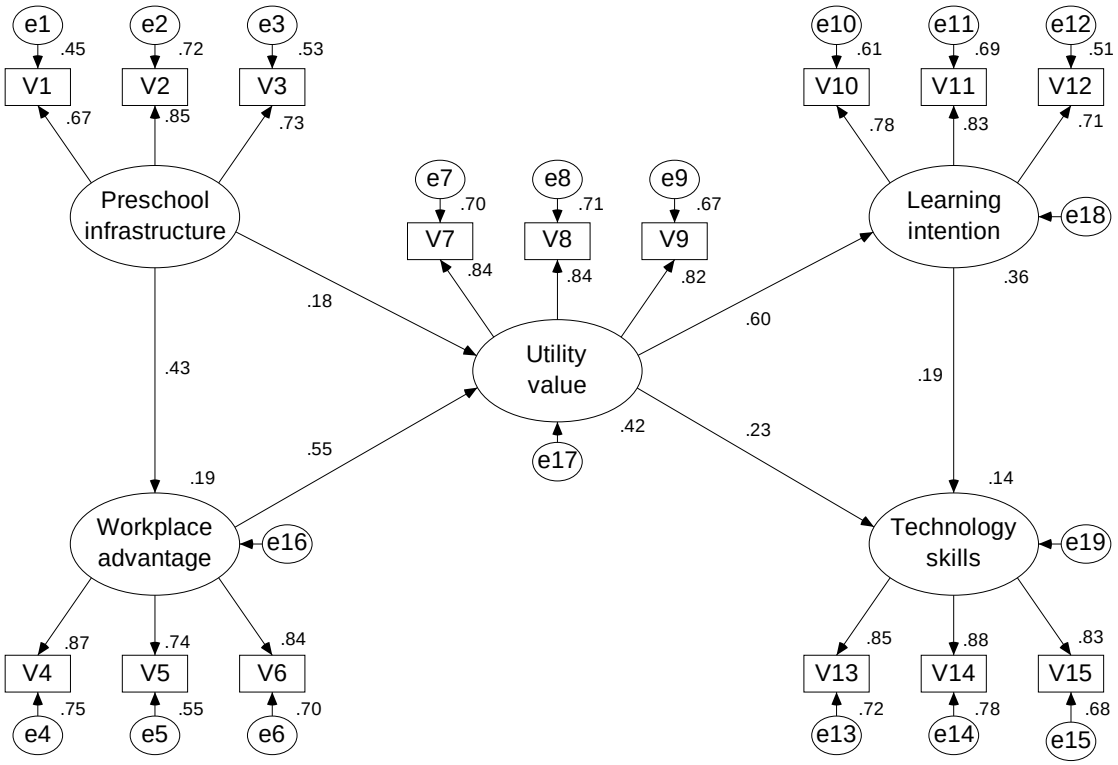


Figure 3: Structural model

The path analysis of H1 (Table 3) suggested that the early childhood pre-service teachers' attitudes toward the provisions for IT-related pedagogical tools for preschool children in Taiwan positively influenced their attitudes regarding the occupational benefits of using IT-assisted teaching practices, with a standardized total effect of preschool infrastructure on workplace advantage of .43. The path analysis of H2 suggested that the early childhood pre-service teachers' attitudes toward the provisions for IT-related pedagogical tools for preschool children in Taiwan positively influenced their attitudes regarding the benefits of increasing their IT-related knowledge through teacher education, with a standardized total effect of workplace advantage on utility value of .42. The path analysis of H3 showed that the pre-service teachers' perceptions regarding the occupational benefits of the use of IT-assisted teaching methods positively influenced their expectations regarding the benefits of increasing their IT-related knowledge through teacher education, with a standardized total effect of workplace advantage on utility value of .55. These results demonstrate positive relationships among the hypotheses for pre-service teachers' attitudes regarding preschool infrastructure, workplace advantage, and utility value.

The path analysis of H4 indicated that the pre-service teachers' expectations regarding the benefits of increasing their IT-related knowledge through teacher education positively influenced their willingness to learn about applications of IT-assisted instructions in teacher education, with a standardized total effect of utility value on learning intentions of .60. The path analysis of H5 indicated that the pre-service teachers' expectations regarding the benefits of increasing their IT-related knowledge through teacher education positively influenced their attitudes regarding the importance of their competency in the use of IT-assisted instruction, with a standardized total effect of utility value on technology skills of .34. The path analysis of H6 indicated that the pre-service teachers' willingness to learn about applications of IT-assisted instructions in teacher education positively influence their attitudes regarding the importance of their competency in the use of IT-assisted instruction, with a standardized total effect of learning intentions on technology skills of .19. This result suggested that their attitudes toward IT-related learning activities have the few impacts on their competences and abilities of using IT into instructions for young children. These results demonstrate positive relationships among the hypotheses for pre-service teachers' attitudes regarding utility value, learning intentions, and technology skills. The bootstrapping analysis indicated the results of all the hypothesis evaluations were statistically significant ($p < .05$).

Table 3: Total effects of path analysis in structural model

Hypothesized relationship among latent constructs	Direct effect	Indirect effect	Total effect
Preschool infrastructure → Workplace advantage (H1)	.43		.43
Preschool infrastructure → Utility value (H2)	.18	.24	.42
Workplace advantage → Utility value (H3)	.55		.55
Utility value → Learning intention (H4)	.60		.60
Utility value → Technology skills (H5)	.23	.12	.34
Learning intention → Technology skills (H6)	.29		.19

The value of the total effect of utility value on learning intentions was the highest among the study hypotheses (standardized total effect of .60; Table 3), indicating the strongest influence among these sets of pre-service teachers' attitudes. In addition, the influence of workplace advantage on utility value was also high (standardized total effect of .55), indicating a strong relationship between these sets of pre-service teachers' attitudes. The total effect of learning intention on technology skills was lowest, compared with the other hypotheses, with a standardized total effect of .19. This result suggests a low level of influence between pre-service teachers' willingness to learn about applications of IT-assisted instructions in teacher education and their attitudes regarding the importance of their competency in the use of IT-assisted instruction. Taiwanese preschool teachers spend a lot of time participating in child-care activities. Consequently, this result limits the time during which they can implement IT-assisted instruction, and this may detract from their attitudes regarding the importance of their competency in the use and development of IT-based teaching methods.

CONCLUSIONS

The practical value and usefulness of IT-assisted instruction for Taiwanese preschool children are popular topics in academic and practical settings. The uses of IT-related applications by pre-service and in-service teachers help young children develop cognitive skills and improve their learning competencies. With the innovative trends in IT-assisted methods, pre-service teachers realize the importance of the workplace advantage associated with the use of IT-assisted instruction both in teacher education and in the classroom.

Because studies of per-service teachers' attitudes regarding IT-related courses in teacher education in Taiwan are scant, the researcher assessed their perceptions of the practical usefulness of IT-related instructions in their work settings and in teacher education. The researcher explored early childhood pre-service teachers' attitudes toward the workplace advantage associated with the use of IT-assisted instruction, and analyzed their intentions to advance their competency in the integration of IT-based methods into their preschool teaching practices.

The latent constructs of preschool infrastructure, workplace advantage, utility value, learning intentions, and technology skills were proposed to test early childhood pre-service teachers' attitudes toward IT-assisted instruction. The survey instrument consisted of a questionnaire that assessed the pre-service teachers' attitudes regarding preschool IT infrastructure and workplace advantage in the preschool setting. The questionnaire also assessed pre-service teachers' intentions to use IT-assisted preschool teaching practices and their intentions to continue to develop their technology skills through teacher education.

The factor structure of the latent constructs in the measurement model with the standardized parameter estimates were supported by the model fitness statistics. The results of reliability (alpha) coefficients of the latent constructs showed that the measurement modeling of the questionnaire data demonstrated a higher coefficient of internal consistency. According to the results of hypothesis testing and the evaluation of the total effects in the structural model, the model fitness indices indicated an acceptable level of fitness for the sample data and significant relationships between latent constructs represented in the questionnaire design. The relationship between the perceived workplace advantage of applying IT to preschool teaching activities and the importance of improving technology skills through advancing pedagogical knowledge and teaching competencies is noteworthy. This finding supports previous research on this area of the IT instructional applications (Chan, 2010; Lyke & Young, 2006; Nikolopoulou & Gialamas, 2009).

The integration of IT into preschool teaching practices requires pre-service teachers to learn how to construct a friendly learning space and build a platform to articulate young children's learning motivations, interests, IT literacy, and academic performance through the IT-related teaching practices. When pre-service teachers consider the workplace advantage of using IT-instruction in preschool, they have more positive intentions to learn and implement IT in their teaching practices. They also perceive the importance of acquiring more pedagogical knowledge and resources to provide their students with opportunities to participate in learning activities and enhance their motivation to learn through their participation in IT-based learning activities. This study produced results which corroborate the findings of previous studies in this field (Gao, Chee, Wang, Wong,

& Choy, 2011; Kidd, Sanchez, & Thorp, 2008; Luan & Teo, 2009).

The findings of this study should indicate the importance of IT-related instruction for young children, thereby encouraging us to explore the integration of IT into preschool teaching practices, as an important pedagogical choice. Early childhood teacher education institutions should design and utilize IT-related courses to enrich the pre-service teachers' learning experience, improve their learning effectiveness, and help them to construct and develop their technology skills in a preschool context. Education institutions should also articulate pre-service teachers' IT literacy with their ability to integrate IT into their preschool teaching practices, such as helping them to design IT-based learning activities, constructing IT-assisted learning settings, and advancing their IT-related professional development.

Early childhood teacher education institutions should provide pre-service teachers with more learning opportunities for the practical development of IT-based teaching instruction for young children. The use of IT-related courses in teacher education could help pre-service teachers better understand the importance of using IT-assisted teaching activities in the preschool classroom. The professional development learning space should also be constructed to empower pre-service teachers in the use of IT-assisted preschool teaching practices to advance their teaching performance in preschool settings.

In summary, measuring the attitudes toward IT-related practices and workplace advantage in preschool settings with adequate statistical analysis is critical for the evaluation of the role of early childhood pre-service teachers' thoughts and their intentions for IT-related learning in teacher education. This study represents one of the earliest attempts to address these issues. This study excluded 21% of the sample from analysis because some respondents left the questionnaire completely blank or did not answer all of the items. Such a return rate can introduce bias, which must be considered regarding the results; furthermore, the results must be interpreted cautiously. Future studies should use appropriate imputation methods to estimate missing values and correct any bias caused by missing data.

The subjects in this study were Taiwanese pre-service teachers, and the results of this study address only Taiwanese situations. However, whether these results will apply to pre-service teachers' attitudes regarding IT-assisted instruction internationally cannot be determined based on these study results. Therefore, further research is warranted in other countries or regions. In order to reduce the statistical inference limitations, future questionnaire-based studies can evaluate geographical and cultural differences in pre-service teachers' views about IT-related practices and learning processes in different countries. In addition, questionnaire-based research can explore differences in pre-service teachers' views based on individual demographics, which may shape more appropriate decisions regarding the importance of leaning intentions and technology skills in IT-related professional development and teacher education.
This study addresses some aspects of issues associated with IT-related instructional practices. There is a continuing need for and adequate theoretical basis for developing questionnaire. Moreover, new latent factors or observed variables can be added into the questionnaire for to further explore pre-service teachers' attitudes regarding the relationships between utility value and teaching competencies in IT-related applications and learning accountability in teacher education. Multiple theoretical perspectives can be emphasized in future versions of the survey instrument. A better understanding of early childhood pre-service teachers' views toward IT-assisted pedagogical practices may facilitate the implementation of IT-assisted practices as an essential tool for innovation to maintain a high level of quality in early childhood education.

IT-assisted instruction for young children in Taiwan is an emerging practice. We must emphasize its application and assist pre-service teachers in understanding and learning the appropriate approaches for improving the learning quality of young children. Future research is necessary to explore IT-assisted instructional practices for young children conducted by pre-service and in-service teachers, and to analyze the advantages and disadvantages of various teaching methods for young children in IT-rich environments to develop their learning interests, motivations, and performance. Pre-service attitudes toward IT-assisted instruction merit future research and considerably must be accomplished. We require increased knowledge related to IT-assisted instructional practices, particularly the strengths and weaknesses of such education for teaching young children. A continuing need exists for adequate theoretical and practical bases for IT applications and appropriate instructional uses for young children.

REFERENCES

Abramovich, S., & Cho, E. K. (2009). Mathematics, computers, and young children as a research-oriented learning environment for a teacher candidate. Asia Pacific Education Review, 10(2), 247-259.

Abu Al-Ruz, J., & Khasawneh, S. (2011). Jordanian pre-service teachers' and technology integration: A human resource development approach. Educational Technology & Society, 14(4), 77-87.

Anderson, S. E., Groulx, J. G., & Maninger, R. M. (2011). Relationships among preservice teachers' technology-related abilities, beliefs, and intentions to use technology in their future classrooms. Journal of Educational Computing Research, 45(3), 321-338.

Billett, S. (2009). Realising the educational worth of integrating work experiences in higher education. Studies in Higher Education, 34(7), 827-843.

Bittman, M., Rutherford, L., Brown, J., & Unsworth, L. (2011). Digital natives? New and old media and children's outcomes. Australian Journal of Education, 55(2), 161-175.

Bollen, K.A. (1989). Structural equations with latent variables. New York: Wiley.

Brownlee, J., Boulton-Lewis, G., & Berthelsen, D. (2008). Epistemological beliefs in child care: Implications for vocational education. British Journal of Educational Psychology, 78, 457-471.

Byrne, B. B. (2010). Structural equation modeling using AMOS: Basic concepts, applications, and programming (2nd Ed). New York: Routledge.

Chai, C. S. (2010). Teachers' epistemic beliefs and their pedagogical beliefs: A qualitative case study among singaporean teachers in the context of ict-supported reforms. *Turkish Online Journal of Educational Technology*, *9*(4), 128-139.

Chalies, S., Bruno-Meard, F., Meard, J., & Bertone, S. (2010). Training preservice teachers rapidly: The need to articulate the training given by university supervisors and cooperating teachers. Teaching and Teacher Education, 26(4), 767-774.

Chan, K. W. (2010). The role of epistemological beliefs in Hong Kong preservice teachers' learning. Asia-Pacific Education Researcher, 19(1), 7-24.

Cullen, T. A., & Greene, B. A. (2011). Preservice teachers' beliefs, attitudes, and motivation about technology integration. Journal of Educational Computing Research, 45(1), 29-47.

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. Psychological Methods, 1(1), 16-29.

Edmunds, R., Thorpe, M., & Conole, G. (2012). Student attitudes towards and use of ICT in course study, work and social activity: A technology acceptance model approach. British Journal of Educational Technology, 43(1), 71-84.

Fish, A. M., Li, X. M., McCarrick, K., Butler, S. T., Stanton, B., Brumitt, G. A., et al. (2008). Early childhood computer experience and cognitive development among urban low-income preschoolers. Journal of Educational Computing Research, 38(1), 97-113.

Gao, P., Chee, T. S., Wang, L. L., Wong, A., & Choy, D. (2011). Self reflection and preservice teachers' technological pedagogical knowledge: Promoting earlier adoption of student-centred pedagogies. Australasian Journal of Educational Technology, 27(6), 997-1013.

Gao, P., Choy, D., Wong, A. F. L., & Wu, J. (2009). Developing a better understanding of technology based pedagogy. Australasian Journal of Educational Technology, 25(5), 714-730.

Garraway, J., Volbrecht, T., Wicht, M., & Ximba, B. (2011). Transfer of knowledge between university and work. Teaching in Higher Education, 16(5), 529-540.

Gomez, L. M., Sherin, M. G., Griesdorn, J., & Finn, L. E. (2008). Creating social relationships - The role of technology in preservice teacher preparation. Journal of Teacher Education, 59(2), 117-131.

Hammond, M., Crosson, S., Fragkouli, E., Ingram, J., Johnston-Wilder, P., Johnston-Wilder, S., et al. (2009). Why do some student teachers make very good use of ICT? An exploratory case study. Technology Pedagogy and Education, 18(1), 59-73.

Hammond, M., Reynolds, L., & Ingram, J. (2011). How and why do student teachers use ICT? Journal of Computer Assisted Learning, 27(3), 191-203.

Kidd, J. K., Sanchez, S. Y., & Thorp, E. K. (2008). Defining moments: Developing culturally responsive dispositions and teaching practices in early childhood preservice teachers. Teaching and Teacher Education, 24(2), 316-329.

Kline, R. B. (2010). Principles and practice of structural equation modeling (3rd ed.). New York: Guilford.

Koc, I. (2012). Preservice science teachers reflect on their practicum experiences. Educational Studies, 38(1), 31-38.

Ljung-Djarf, A. (2008). To play or not to play - That is the question: Computer use within three Swedish preschools. Early Education and Development, 19(2), 330-339.

Luan, W. S., & Teo, T. (2009). Investigating the technology acceptance among student teachers in Malaysia: An application of the technology acceptance model (TAM). Asia-Pacific Education Researcher, 18(2), 261-272.

Lyke, J. A., & Young, A. J. K. (2006). Thought in context: Students' perceptions of classroom goal structures and reported cognitive strategy use in the college classroom. Research in Higher Education, 47(4), 477-490.
Ma, A. K. F., O'Toole, J., & Keppell, M. (2008). An investigation of student teachers' attitudes to the use of media triggered problem based learning. Australasian Journal of Educational Technology, 24(3), 311-325.
MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. Psychological Methods, 1(2), 130-149.
Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. Computers & Education, 56(2), 429-440.
McDonald, M., Tyson, K., Brayko, K., Bowman, M., Delport, J., & Shimomura, F. (2011). Innovation and impact in teacher education: Community-based organizations as field placements for preservice teachers. Teachers College Record, 113(8), 1668-1700.
McKenney, S., & Voogt, J. (2010). Technology and young children: How 4-7 year olds perceive their own use of computers. Computers in Human Behavior, 26(4), 656-664.
Nikolopoulou, K., & Gialamas, V. (2009). Investigating pre-service early childhood teachers' views and intentions about integrating and using computers in early childhood settings: Compilation of an instrument. Technology Pedagogy and Education, 18(2), 201-219.
Petersen, N. (2007). Pre-service teacher education students' engagement with care and social justice in a service learning module. Education as Change, 11(3), 169-181.
Rusznyak, L., & Walton, E. (2011). Lesson planning guidelines for student teachers: A scaffold for the development of pedagogical content knowledge. Education as Change, 15(2), 271-285.
Sackes, M., Trundle, K. C., & Bell, R. L. (2011). Young children's computer skills development from kindergarten to third grade. Computers & Education, 57(2), 1698-1704.
Sahin, I. (2011). Development of survey of technological pedagogical and content knowledge (tpack). *Turkish Online Journal of Educational Technology*, *10*(1), 97-105.
Santiago, A. (2009). Impact of sandwich course design on first job experience. Asia-Pacific Education Researcher, 18(2), 205-217.
Schumacker, R. E., & Lomax, R. G. (2004). A beginner's guide to structural equation modeling (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
Sims, L., & Walsh, D. (2009). Lesson study with preservice teachers: Lessons from lessons. Teaching and Teacher Education, 25(5), 724-733.
So, H. J., & Kim, B. (2009). Learning about problem based learning: Student teachers integrating technology, pedagogy and content knowledge. Australasian Journal of Educational Technology, 25(1), 101-116.
Swanson, V., Broadbridge, A., & Karatzias, A. (2006). Earning and learning: Role congruence, state/trait factors and adjustment to university life. British Journal of Educational Psychology, 76(4), 895-914.
Teo, T., Ursavas, O. F., & Bahcekapili, E. (2012). An assessment of pre-service teachers' technology acceptance in Turkey: A structural equation modeling approach. Asia-Pacific Education Researcher, 21(1), 191-202.
Tondeur, J., van Braak, J., Sang, G. Y., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. Computers & Education, 59(1), 134-144.
Wong, L. H., Gao, P., Chai, C. S., & Chin, C. K. (2011). Where research, practice and the authority meet: A collaborative inquiry for development of technology-enhanced chinese language curricula. *Turkish Online Journal of Educational Technology*, *10*(1), 232-243.
Yildirim, D., Kececi, A., & Bulduk, S. (2011). How do Turkish nursing students plan their career after the graduation? A questionnaire survey. Asia Pacific Education Review, 12(3), 373-380.
Yurdakul, I. K. (2011). An evaluative case study on professional competency of preservice information technology teachers. *Turkish Online Journal of Educational Technology*, *10*(3), 33-53.

Understanding Synchronous Computer-Mediated Classroom Discussion through Cultural-Historical Activity Theory

Yangjoo Park
yjpark90@gmail.com

ABSTRACT
This study is about graduate students' discourse practices in classroom text-based synchronous computer-mediated discussions (SCMD). Cultural historical activity theory (in short, Activity Theory) is the primary theoretical lens through which the data are analyzed. Engeström's (1987) Activity System model among the various theoretical positions or perspectives of activity theorists has guided the overall process of the study, especially having the researcher focus on the identification and description of the model's six key elements: subject, object, tool, community, rule, and division of labor. Several emerging themes were identified: instead of a single utterance, a topical pair needs to be investigated as a unit of analysis in SCMD research; a collective unit of actions emerges through the discourse activity; and, finally, an ecological view is needed to understand an activity system as a whole. Based on these emerging themes, the implications for future research are discussed as a conclusion.

INTRODUCTION
This study is about graduate students' discourse practices in classroom text-based synchronous computer-mediated discussion (SCMD). Since the introduction of synchronous computer-mediated communication (SCMC) to educational practices, its technological affordances of both real-time and remote interactions have been supposed to enrich and promote students' social interactions, and, consequently, their learning (Beauvois & Jamieson, 1997; Dickey, 2003; Duemer et al., 2002; Kern, 1995; Lobel, Swedburg, & Neubauer, 2002; Warschauer, 1996; Sotillo, 2000). This assumption has made more and more educators adopt the technology in their practices to facilitate peer discussions and interactions.

Although the synchronous communications through wired or wireless network of computers are prevalent in current days, the pedagogical application of the technology has not been fully explored, and, furthermore, theoretical explication of it does not have sound foundation that most researchers agree upon yet (De Laat, & Lally, 2003; Luppicini, 2007). Researchers have emphasized the needs of more comprehensive theoretical framework, such as Cultural-Historical Activity Theory (Activity Theory), that provides both socio-cultural and systemic accounts for the educational use of the technology (Resta & Laferrière, 2007; Tolmie & Boyle, 2000). This study is an explorative attempt to use Activity Theory as a theoretical and methodological framework for the analysis of students' discourse practices in SCMD. Therefore, the purpose of this study was to explore and describe students' discourse activity with SCMC technology through the lens of Activity Theory, and to deepen and broaden our understandings on Activity Theory in CMC research through the lens of SCMD.

A BRIEF INTRODUCTION TO ACTIVITY THEORY
Vygotsky's socio-cultural theory of learning is a root of Activity Theory. He introduced the concept of tool-mediation in human activity to illustrate the uniqueness of human intellect (Vygotsky, 1978). According to him, we cannot successfully identify higher mental function of human psychology with any theoretical assumption of direct encounters between a subjective agent and objective world. It will lead us only to either material determinism in which the agent is considered a sum of reflected objective world, which does not take the dynamic roles of human beings in practices into account, or cultural reductionism in which the symbolized culture in the human mind determines the interpretation of the world, which is not capable of explaining the critical role of the objective world in human intellects.

To explicate the unique aspects of the human mind, Vygotsky (1978) devised the concept of tool-mediation in human activity, in which a subject and the external world are mediated by material and psychological means produced in the past of the subjects' individual or the societal history. Of course, this is not the first attempt to introduce a mediator to explain human mind. For example, Piaget, influenced by Emmanuel Kant's categories of mind, suggests schema as such a mediator (Duncan, 1995). An individual cannot come across the external world directly. The encounter is only possible through schema that belongs to the individual who is actively trying to interpret the world to survive in it. To achieve equilibrium between the inner schema and the outer condition, the cognizant is continuously assimilating the external world and accommodating the internal schema, which leads the genetic process of cognitive development. In his framework, the cognitive schema mediates an individual's biological needs of seeking equilibrium and the external environments' affordances affecting and limiting the

realization of the agent's needs. In addition to that, he argues that, being consistent with Kantian metaphysical epistemology, the cognitive development follows universal structure, which is presumed to individual experiences a priori.

Similar to Piagetian theory, Vygotsky's cultural tool needs also be seen as a lens through which a person can have relations with the external world and that forms or conditions the relationship, not a simple device to facilitate human activity. In the system of tool-mediated activity, the subject representing the human mind can only run into material environment through the help of cultural artifacts or instruments, which is the role of cognitive schema in Piagetian theory.

What distinguishes Vygotsky's psychological tool from Piaget's cognitive schema as a mediating means is the social origin of the mediator (Wertsch, 1998). Contrary to Piagetian accounts based on biological heredities and metaphysical structure, Vygotsky places the social origins of the auxiliary tools and the developmental stages at the center of his theory. Vygotsky's mediator is also a social product of one's own or others in the society, while the cognitive schema of Piaget is based on the universal structure given 'a priori' to any individual's experiences.

Extending and elaborating Vygotsky's idea, Leont'ev (1978), his student and colleague, proposed an activity theory called Cultural Historical Activity Theory later. He asserts that the object of psychological study should be neither objective behavior nor subjective consciousness of the human mind, but the whole object-oriented activity. In practice, a subject, participating in object-oriented activity, confines herself to the condition of the object to realize her intention, and the object is subjugated under the motive of the subject. He calls the former as "objectification of the subject" and the latter as "subjectification of the object" (Leont'ev, 1978). Subject and object do not exist indifferently any more, but interdependently in human activity, which is the way that Activity Theory resolves the traditional contradiction of subject versus object.

Leont'ev (1981) distinguishes three levels of activity – activity, action, and operation – by analyzing the division of labors in collective practices, which are connected to collective motive, individual goal, and the condition of material and semiotic tools in order. The action of a pitcher throwing a ball to a catcher in a baseball game cannot be understood without the consideration of the collective motive of the team, winning a game, and the operations of the material and semiotic tools such as balls, gloves, game rules, and so forth. While Vygotsky's model is based on dyadic interaction between a child and an adult or a more advanced other, Leont'ev's framework extends it to individual actions in a collective activity, which can be properly construed only through systemic lenses.

Engeström (1987) articulates and visually depicts Vygotsky and Leont'ev's arguments. He situates Vygotsky's tool-mediated and object-oriented action into Leont'ev's collective activity, and formulates an activity system model, in which social factors such as rule, community, and division of labor are incorporated to illustrate the interconnectedness of each component of the system. In the system, community is defined as a group of people who share the same general object; rule refers to the explicit and implicit regulations, norms, and conventions that constrain actions and interactions within the system; and division of labors indicates that the division of tasks between members of the community both horizontally and vertically.

METHODS

Site

The site of this study was a graduate course offered in the Department of Educational Psychology at a large research university in the southern United States in the fall semester of 2009. The course, open to both master's-level and doctoral students, had been offered every other year for more than 20 years. The instructor had been employed the classroom online discussion using either synchronous or asynchronous CMC technology since 1994. It was basically a seminar-type course for advanced graduate students, in which peer discussions in both face-to-face and CMC modes were the primary classroom activities rather than teacher-led lectures.

Students were required to meet weekly to discuss three or four articles on theories of writing and composition in general. Each week, the class met first in a classroom in which the instructor and students sit at tables arranged in a large circle encompassing all the class members. After a short announcement and lecture-type summary of the readings, the instructor typically began the oral discussion by inviting the students to share their ideas on the readings with other classmates and to raise any issues related to the topics. The oral discussion usually lasted for an hour and 30 ~ 45 minutes.

After a 10 to 15 minute break, students walked to a computer lab, and continued the online discussion using a Web-based chat system. The computer lab was configured to be more relevant to lecture type activity or

individually separated works than small group collaborations, which turned out to be helpful for students to focus on the discussion displayed on each monitor. Other sounds, however, such as typing keyboards, clicking mouse buttons, and laughing, were somewhat distracting for students' concentration.

During each session of online discussion, students saw a window on their screens, embedded in a Web page, with two panes separated by a horizontal line. In the top pane, they read the messages as they were posted. Whenever a participant sent a comment, it was posted to the discussion in the order received by the server. Comments were displayed in the top pane chronologically, one after the other, with the ordinal numbers and the authors' names. All comments previously posted in the discussion were available for the participants to read at any time. If a participant intended to read a comment posted earlier in the discussion, he or she might simply scroll up the list in the top pane to locate it.

In the bottom pane, students composed their own messages by typing and editing just as they would do with word processing software. Unlike other current synchronous instant messaging programs, the software did not provide any functionality of noticing if others were composing their message currently. The users could not have any indication of whether others were composing a message until the comments were posted. A participant had to hit the "enter" or "return" key to send a message, and it appeared in the top pane as a part of the public discussion.

Participants

Of the nine students enrolled in the course on the 'theory and practice of writing seminar,' six were women and two were men. The students came from various programs in the college of education at the doctoral level: three students from Educational Psychology; three students from Language and Literacy; two students from Foreign Language Education (FLE); and one student from Special Education. This group of students was also diverse in terms of ethnicity. There were two Asian, two Mexican-American, and five white Americans.

Data sources

The primary source of data was the transcript of SCMD. There were 13 online synchronous discussion sessions out of 14 classes. The first session was a kind of exercise for students to experience the SCMD, which lasted about 10 minutes, and there were no online session at the last class meeting when students and the teacher met at a place outside the campus. Except for the first exercise session, the members as a group produced 82 (the seventh session) to 158 (the second session) messages for about 30 to 45 minutes. The transcripts were saved on the server as a downloadable text file. As secondary data sources, weekly readings, field notes from the observation of classroom oral discussions, recorded audio-files of them, and other documents that students wrote as class assignments were collected and analyzed as needed.

Note on trustworthiness

Lincoln and Guba (1985) have suggested various techniques to establish trustworthiness of qualitative research. This study employed some of their techniques: prolonged engagement, persistent observation, triangulation, peer debriefing, and keeping a reflexive journal.

To minimize possible distortions that might result from my presence in the classroom discussion, even as a silent observer, I sustained the engagement with the participants from the beginning to the end of the semester (*prolonged engagement*); participated in and took field notes of every classroom discussion to avoid any biased interpretation based on partially collected data (*persistent observation*).

Triangulation is the use of multiple sources of data, multiple settings, and multiple methods of data collection to support emerging research themes and to explain the research findings (Lincoln & Guba, 1985). As described earlier, this study had a variety of data sources including audio files of classroom oral discussions, field notes from classroom observations, assigned readings, and other documents produced by students as well as the transcripts of SCMD sessions, which were collected utilizing multiple methods. The evidence from these different sources and different methods was continuously explored, connected, compared, and synthesized to construe the complicated structure and dynamics of SCMD.

The findings from on-going analyses and the interpretations of them were discussed with other colleagues who were not directly participating in the study (*peer debriefing*), and I recorded thoughts, decisions, questions and insights related to the research (*keeping a reflexive journal*). From my personal experiences with content analyses in SCMD, I expected that there would be many instances that have no clear evidence of what the comment means, which message it is responding to, what the primary purpose of the speech act is, and so forth. I used short and informal interviews with participants, as needed, to lessen the ambiguity of the data (*member*

checking).

AN OUTLINE OF THE ACTIVITY SYSTEMS IN SCMD

There were 14 class meetings in the semester, of which 13 classes had online discussion sessions. The first online session lasted about ten minutes, because it was a kind of introduction to the new environment and communicational mode. Thus, actually, 12 sessions were devoted to discussion on class topics. The participants produced total 1,682 utterances during 13 SCMD sessions, which was 129.4 per each.

Subjects: Subject of an activity system is defined as "the individual or subgroup whose agency is chosen as the point of view in the analysis" (Engeström, n.d., para. 4). Because the purpose of this study was to trace the discourse activity in SCMD in a graduate course, the instructor and the nine students who participated in the online chat sessions were the subjects of the activity system in question.

Objects: In any conversational situation, the interlocutors make efforts to fit their utterances into the topic or to change it with their speech acts. Therefore, a discourse topic is posited as the object of individual activity in this report, which will be transformed into an utterance, as the outcome, of its author as the subject. A topic can either be imposed from the outside of the current system or emerge from the inside. Usually, the syllabus of a course has its list of class topics that will be the starting or major topic of each class. On the other hand, there are discourse topics unfolding in the middle of the discourse practices. For the most part, these emerging topics are nested under the given class topics.

Tools: An utterance should be in the forms of "electronic" and "written text" in SCMD. The interlocutors utilize written texts to express their idea or to interpret others' thought, and operate SCMC technology to deliver their own message and to receive others'. As Activity Theorists contend, there are two categories of material and semiotic tools in any activity. The SCMC technology such as computer hardware and software may be regarded as the example of material tools, while the written text is a semiotic means.

Community: Because this project regarded the topic as the object of the system, community was made up of the class members who shared the general class topics. However, although some class topics were given to all the members, discourse topics also dynamically emerged and disappeared with the interlocutors' continuous gathering and dispersing. The people who shared a discourse topic also formed a community that would be called as a sub-community of the whole class community.

Rules: This study could identify three categories of rules in the activity system. Those were related to the tool use, institutional context, and rhetorical situation of topical discussion. First, the functionalities and affordances of technology controlled students' activity. It was critical to follow the rules to operate the tools, for the SCMC connected the interlocutors' communication physically. Second, the University's institutional rules and the instructor's pedagogical practice governed the system. Finally, the analysis found some patterned rhetorical practices in SCMD. Of course, there was no explicit rule or norm of how to develop topical discussions, the subjects showed repeated patterns of participation such as opening, topical discussion, and closing.

Divisions of labor: Four types of key roles emerged from the SCMD. They were instructor, technological leader, socio-emotional facilitator, topical initiator and follower, and experts in different domains of knowledge.

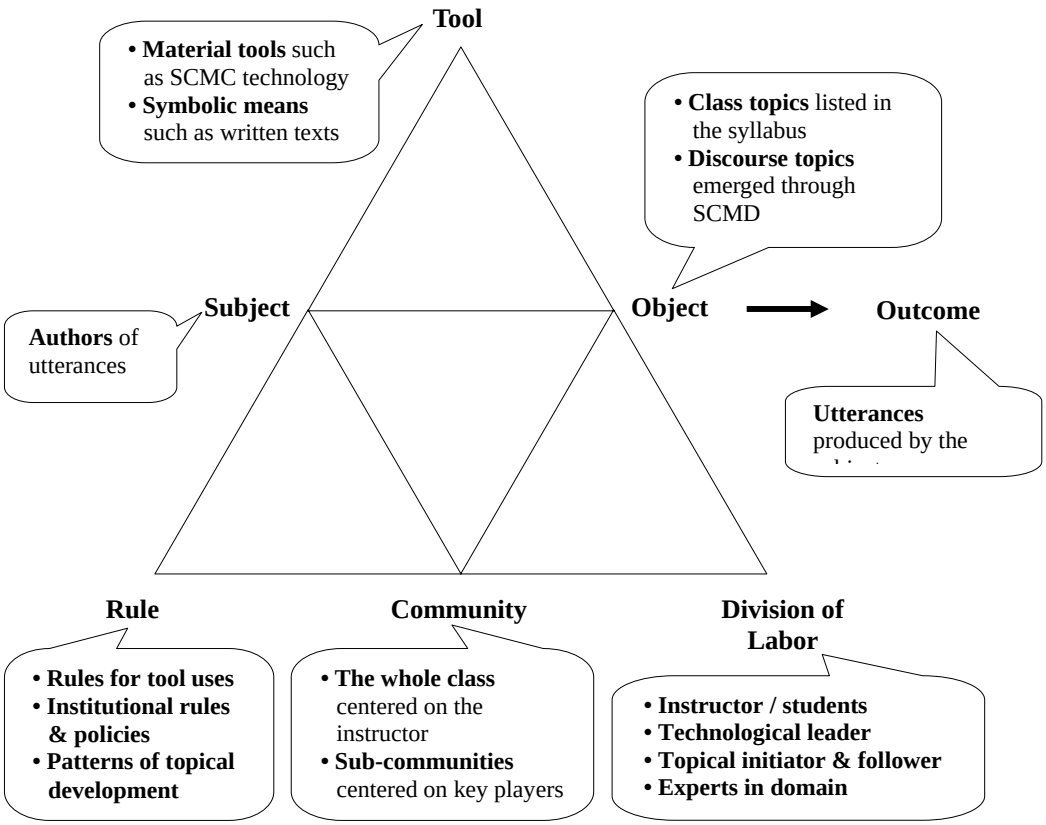


Figure 1. Summary of Activity Systems in SCMD

SCMD THROUGH ACTIVITY THEORY

Based on the activity system described above, three themes emerged. Firstly, the pair of dialogical utterances may be investigated as the minimum unit of analysis in SCMD research. Secondly, even though temporary and fragile, there is the moment that a collective unit of subjects emerges. Finally, both within and beyond the current system, the discourse activity with SCMC technology may be explained as an ecology of activity systems.

Topical pair as the minimum unit of analysis in SCMD research

10. Joyce: Has anyone experienced flow when writing? What about during other activities?
21. Henry: @Joyce (#10)-I think sports is the immediate context for me, although watching sports and losing track of time probably doesn't count as flow. (From Session 9, October 22, 2009)

An utterance is a response to a preceding speech act in a dialogical context. It is, in terms of Speech Act Theory, the perlocutionary effect as a rejoinder of the illocutionary intention of the responded utterance. Henry's comment (#21) answered Joyce's illocutionary forces of questioning. The part of "the immediate context" in Henry's exchange cannot be comprehended unless the content of Joyce's question is taken into account. Considering the class topic of the session, "Influence of Emotions on the Writing Process," and the fact that one of the weekly readings was related to the experience of psychological flow, we may conjecture what Joyce would have had in her mind when raising the issue of flow as a response to a preceding utterance of the class topic or the course reading. To understand the current utterance, it is necessary to apprehend the utterance to which it responds. Without the consideration of the preceding utterance as a part of the whole, it is not possible to understand the meaning and the intention of the current speech act in a given situation.

On the other hand, a subject initiates an utterance to have a rejoinder in the future. In the example, Joyce posted the comment to invite others to the topical space about the experience of flow in writing or other activities. The illocutionary intention of her inquiry may only be achieved with the help of others. With Henry's cooperation as a perlocutionary effect, her speech act could be completed. A question is to elicit answers, and an argument is to prompt acknowledgement, agreement, or counter-argument. To conceive of an utterance as a unit of analysis, as Bakhtin argues, the dialogical chain, as a whole, needs to be taken into account, not a speech act isolated from it. This point raises an issue of the unit of analysis in a dialogical situation such as SCMD.

For Vygotsky (1986), the unit of analysis is "a product of analysis," which "retains all the basic properties of the whole," and "cannot be further divided without losing them" (p. 5). It is not "the chemical composition of water," but "its molecules and their behavior" as the unit of analysis to understand the properties of water. Continuing the argument, he insists that the unit of human intellect be the "word meaning."

> What is the unit of verbal thought that meets these requirements? We believe that it can be found in the internal aspect of the word, in word meaning. Few investigations of this internal aspect of speech have been undertaken so far, and psychology can tell us little about word meaning that would not apply in equal measure to all other images and acts of thought (Vygotsky, 1986, p. 5).

Language is not a device that an individual has created through his or her ontogenetic history. It is the property of a society, and the person can only appropriate it. The "internal aspect of the word" is the "word meaning," which indicates, in terms of Vygotsky, the auxiliary means that has been internalized through the social interactions in the individual's life. His approach is investigating human psychology as the internalized means that has once belonged to the objective world. Therefore, the argument underlying the "word meaning" as the unit of analysis is that both the internal consciousness and the external object should be conceived as a whole that cannot be reduced to isolated elements. Leont'ev (2009) points out:

> Thus activity that is internal in its form, originating from external practical activity, is not separated from it and does not stand above it but continues to preserve an essential, two-fold connection with it. (p. 97)

Leont'ev (2009), extending Vygotsky's approach, contends that the object-oriented activity be the unit of analysis for psychological studies. For him, human activity is not only tool-mediated, as Vygotsky asserts, but also object-oriented, which is situated in a community of practice. The unit of word meaning is too narrow to include the various aspects of an activity, and it needs to be extended to a more overarching system. Explaining Leont'ev's concept of activity, Kuutti (1991) writes:

> The solution offered by Activity Theory is that there is a need for an intermediate concept - a minimal meaningful context for individual actions - which must form the basic unit of analysis. This unit - better defined and more stable than just an arbitrarily selected context, but also more manageable than a social system – is called an activity. Because the context is included in the unit of analysis, the object of our research is always essentially collective, even if our main interest lies in individual actions. (p. 254)

Engeström's systemic model represents this object-oriented, tool-mediated, and community-based activity as the unit. However, it has been acknowledged that the activity system model does not capture the dynamic interactions between different traditions, perspectives, and cultures in a dialogical situation (Daniels, 2004; Engeström, 2001; Cole, 1988; Griffin & Cole, 1984). Although the historical and dynamic aspects of human activity are frequently emphasized in activity theorists' works, the systemic model of activity does not afford any analytical framework for dialogical interactions between different systems.

In terms of the unit of analysis, the problem may stem from its failure to apprehend the dialogical pair as the unit, not a single isolated outcome of utterance. As was discussed earlier in this section, an utterance in a conversational situation is located in the flow of dialogical chains forming dialogical pairs that are not reducible to their constituents. Without the wholeness of the responding and the responded parts of a pair taken into account, we may not comprehend an utterance situated in the dialogical context relevantly. Therefore, I argue that the minimum unit of analysis for the CMC research needs to be the dialogical pair of the responding and the responded utterances.

Emergence of collective action

The pair unit in dialogue involves at least two utterances: an initiation and a response. In the unit, two different systems of utterance production share the key elements of an activity system, become fused together, and form a collective action in which the initiator and the responder function as an agency of the system. The subjects in the pair may be regarded as a unit, because their needs, objects, tools, and communal contexts are shared in the practice of dialogue.

First, the topic as the object of activity system is shared. When two utterances become a pair when the second utterance is connected, as a response, to the first one, the initiation is transformed into a thematic exchange while

the response being a rhematic one (Gruber, 1998). During this formation of a dialogical pair, a discourse topic emerges. It is embedded in the initiation, and activated by the response. The topic is in the initiator's possession, for it derives from his or her utterance, and, at the same time, it is the responder who determines the discourse topic because the initiation will remain as an unrealized attempt to be a topical pair until it has a rejoinder. Topic is produced through the collaboration of the pair, which is the shared object of the collective action of the interlocutors.

Second, the subjects' needs are shared in the pair of dialogical exchanges. Production and publication of the second utterance entails participation in the topical space that the initiator has established. The initiator's intention or driving need is embedded in the space, and, to participate in the space, the responder should accept and be subordinated to it.

17. Henry: So, was anyone else trying to figure out how much the various pay rates in the proofreading article would work out to in current dollars?
31. Amy: i wondered if there were any guidelines about proofreading here… (From Session 13, November 19, 2009)

Henry raised the issue of the various pay rates in proofreading. Amy told, in her response, that she had also wondered about such guidelines, which indicated that she had the same, or at least similar, kind of interest as Henry did. To participate in the topical space that Henry had set up, a responder should exhibit some kind of relations with the existing illocutionary force. For instance, another member could show agreement; raise a related question; provide supplementary information; or tell a joke about the pay rates of proofreading. In any cases, the participants share the Henry's original needs to know the proofreading pay rates, and collaborate to satisfy the needs and to achieve the goal.

Third, the tools are shared. The interlocutors utilize the same SCMC technology as the communicational medium and the same language that is comprehensible for all of the participants. Furthermore, the second utterance of the pair reuses or paraphrases the words, concepts, phrases, or sentences in the first utterance to show the relation to it. In the example, Amy repeated Henry's word, "proofreading" originated from the class topic and one of the articles of the week. Even though there were no vocatives or orientational markers indicating to which message Amy's comment was directed, the participants, and the researcher as well, could notice that her message is a continuation of Henry's comment due to the use of proofreading. Having been a tool that had served Henry's purpose, the word, proofreading was employed to express Amy's similar curiosity and to exhibit the connection of her comment to Henry's. The constitution of a dialogical pair implies the exhibition of any kinds of relations between them. The whole or a part of the written texts as a symbolic means of the initiating utterance are repeated, paraphrased, revoiced, and, therefore, shared in the collective action of the pair.

Finally, the paired activity systems are situated in a shared context. They are based on the same physical environment and institutional context; by responding and being responded to, they co-participate in the current social interactions; and both of them collaborate to develop a shared topic at the cognitive and intellectual dimension. Because of that, they form a sub-community, follow the same institutional rule or rhetorical genre as typified social action (Miller, 1984; Bazerman, 1994; Swales, 1990), and partake in a role divided and expected socially.

In sum, the two activity systems in a dialogical or topical pair share the needs, the topic as an object, material tools and symbolic means, and contexts of discourse community. This may satisfy the conditions for the formation of an activity system, in which multiple subjects function as one unit. In other words, when the second utterance responds to the first one, both exchanges form a dialogical pair, the outcome of the collective action of the initiator and the responder as a subject of the system.

Ecology of activity systems

An activity system is embedded in various practices of communities that differ in kind, scope, direction, and history. To describe and understand an activity system comprehensively, it needs to be delineated as a sub-system or an agent of the whole ecology of activity systems.

As discussed so far, an activity cannot exist isolated from the relations to other systems. Within SCMD, every utterance is, directly or indirectly, connected to other utterances. Both an initiation and a response shape and are shaped by each other reciprocally in the process of dialogical activity. A student may initiate a topical thread in consideration of other members' interests, and they may respond to it intrigued by the initiation. The initiation is affected by the imagined future utterances from others, while it prompts the responder to enter into the topical

space. In the activity system of a dialogical pair, the future response is presumed before the initiation, and the past initiation is realized in the current response. The current activity system of utterance production is located in the network of dynamic interactions between different systems within the SCMD, which, as a whole, may be conceived as ecology of activity systems.

Activity systems beyond the current site of SCMD also intervened in the activity systems within it. The instructor's activity of course design dominated the SCMD. The outcome of her activity system had determined most of critical components of the SCMD such as class topics, weekly readings, communication tools, times and places, and so forth. Her design activity had initiated the SCMD, to which the class members responded with their participations. The institutional activity system of the University was the context of both the instructor's and the students' activity systems. The university defined the different divisions of labor between the instructor and the students, and the participants as members of the institution followed the rules set by the university.

The activity systems of technology designers, developers, and managers also played critical roles in the SCMD. Not only the students' discourse practice might be possible due to the activity of the technology groups, but also their activity had predetermined the patterns and the ways that the subjects participated in the activity. The instructor and the students should be subordinated to the functionalities and the affordances of the technology, in which the designers' and the developers' purposes or intentions were embedded. The users responded to the designers or the developers by following their prescriptions, and the latter achieved their goals by serving the formers' purposes.

The SCMD was also embedded in the activity systems of the academic discipline of writing research. The authors of the weekly readings were invited to the discourse activity; they spoke through the subjects' voices, and the subjects wrote using the authors' voices; and the SCMD continued the dialogical practices of the thought community. The rules how to participate in and develop the theoretical topics dominated the activity, and the agents who know more about the topic played key roles in the activity system.

An activity system in SCMD is located in a complicated and intertwined dialogical network, in which different systems emerge, interact, and disappear continuously and dynamically. Furthermore, the system itself is a dialogical response to external or broader systems of activity. These activity systems, co-present within and beyond the current activity, form the ecology of activity systems as a whole.

CONCLUSION

In this article, I have described the six elements of Engeström's activity system model in order to identify the kinds and the characteristics of the discourse activity enacted in the context of synchronous online classroom discussion. The major theme emerging from the investigation is that these elements form an irreducible whole determining each other reciprocally, which is situated in the intersection of various broader communities.

Findings from this study may yield productive implications for the future research. First, the focus of educational research on SCMD needs to move from the surface to the deep structure of the activity. Based on this report, an activity system stems from multiple dimensions of contexts, which interact together and co-determine the individual actions simultaneously. Nonetheless, the practice of CMC research does not proceed far beyond the surface level. For example, the long-lasting and still on-going discussion about the unit of analysis in CMC research is mostly about determining the starting and the ending points of data from transcripts. In general, sentences, messages, paragraphs, and threads are used as examples (De Weaver, et al., 2006). Clear rules for the identification and the distinction of units will increase, using statistical terms, the reliability of the research. However, the validity of the study remains questionable as questions such as why a unit is more valid than another has not found sound theoretical rationales as of yet. Because the observable facade of a unit is deeply situated in the system of activity, the discussion on unit of analysis should take not only the rules to identify a unit at the surface level, but also the hidden, more substantially determining, and deeply structured factors into account.

Second, the study suggests that the focus of future research on SCMD be moved from the isolated elements to the interconnected system as a whole. According to Activity Theory, an activity system forms an irreducible whole, which cannot be divided into its elements without losing its unique features (Wertsch, 1998). Subjects' driving needs should be understood in relation to the objects to which they are oriented; an object should be conceived as a true motive when being combined with subjective needs; and, in an activity system, tools have dual statuses of both an objective entity belonging to the external world and a part of the extended body of a subject. Failing to grasp the whole system and focusing only on the parts isolated from the whole may lead a researcher to more confusing or conflicting conclusions. A researcher whose purpose is to prove the

effectiveness of technology use in a classroom discussion should take into consideration its relations to the users' intentions, the characteristics of tasks, the institutional culture and rules, the divisions of labor in the community, and various kinds of intervening sub-, and meta-systems of activity as a whole. The different configurations of the related elements of a system may produce contrasting consequences for the same technology use, which may confuse the researcher or mislead the conclusions of the study.

The third implication of the study derives from the emergence of collective subject unit. Educational researchers have been interested in the phenomenon of learning as the process in which an individual is engaged and the product that remains in the individual's mind or behavior as a result of the process. The traditional interpretation of Activity Theory is consistent with this framework. When a subject employs an objective, either material or semiotic, tool to participate in an activity, the meaning of the tool as a symbolic means emerges. The objective tool use is directed toward the object, and the symbolic means emerging from it is oriented toward the subject. The objective tool is employed to change the external world, while the meaning alters the internal mind. Vygotsky's concept of internalization corresponds to the transformation of the material or social entity into a symbolic and psychological one, which is one of his main concepts related to the process of learning. Here, again, the focus is on the individual who participates in the social interaction with more knowledgeable others and becomes equipped with psychological residuals as a consequence of the social practice. However, the findings of this study suggest the possibility of a collective unit of subjects emerging from their dialogical transactions. They share a general object, material tools, repository of symbolic means, and physical, institutional, and academic contexts, and, consequently, perform as an agent of the system. They participate in the process of learning as a unit, which implies that there will be some kinds of residuals somewhere in their minds or in the community. Although this study does not provide any clear evidence or argument about collective learning in contrast to individual learning, which was not the purpose of the study and is beyond its scope, the findings intimate the emergence of a collective unit of learners. This suggests that future research answer such questions as what exactly the product of collective learning would be; where it would be located; whether it is an aggregated sum of each psychological residual or a communal residual qualitatively different from the individual learning; how we may identify them; and so forth.

References

Bazerman, C. (1994). Systems of Genre and the Enactment of Social Intentions. In A. Freedman & P. Medway (Eds.), *Genre and the new rhetoric* (pp. 79-101). London: Taylor & Francis Ltd.

Beauvois, D., & Jamieson, J. (1997). Computer-mediated communication (CMC): technology for improving speaking and writing. In M. Bush (Ed.), *Technology enhanced language learning* (pp. 165-184). Lincolnwood, IL: National Textbook Company.

Cole, M. (1988). Cross-cultural research in the sociohistorical tradition. *Human Development, 31*(3), 137–151.

Daniels, H. (2004). Activity Theory, Discourse and Bernstein. *Educational Review, 56*(2), 121-132.

De Laat, M., & Lally, V. (2003). Complexity, theory and praxis: researching collaborative learning and tutoring processes in a networked learning community. *Instructional Science, 31*(1/2), 7-39.

De Wever, B., Schellens, T., Valcke, M., & Van Keer, H. (2006). Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review. *Computers & Education, 46*(1), 6-28.

Dickey, M. D. (2003). Teaching in 3D: Pedagogical affordances and constraints of 3D virtual worlds for synchronous distance learning. *Distance Education, 24*, 105-121.

Duemer, L., Fontenot, D., Gumfory, K., Kallus, M., Larsen, J., Schafer, S., & Shaw, B. C. (2002). The use of online synchronous discussion groups to enhance community formation and professional identity development [Electronic Version]. *Journal of Interactive Online Learning, 1*. Retrieved January 14, 2014, from http://www.ncolr.org/jiol/issues/PDF/1.2.4.pdf.

Duncan, R. M. (1995). Piaget and Vygotsky revisited: Dialogue or assimilation? *Developmental Review, 15*, 458-472.

Engeström, Y. (n.d.). The activity system. Retrieved January 14, 2014, from http://www.edu.helsinki.fi/activity/pages/chatanddwr/activitysystem.

Engeström, Y. (1987). *Learning by expanding: an activity-theoretical approach to developmental research*. Helsinki, Finland: Orienta Konultit.

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133-156.

Griffin, P. & Cole, M. (1984). Current activity for the future: the zo-ped. In Rogoff, B. & Wertsch, J. (Eds). *Children's learning in the Zone of Proximal Development*. San Francisco: Jossey-Bass.

Gruber, H. (1998). Computer-mediated communication and scholarly discourse: Forms of topic-initiation and thematic development. *Pragmatics, 8*(1), 21-45.

Kern, R. G. (1995). Restructuring classroom interaction with networked computers: Effects on quantity and characteristics of language production. *Modern Language Journal, 79*(4), 457-476.

Kuutti, K. (1991). The concept of activity as a basic unit of analysis for CSCW research. Proceeding of the second ECSCW'91 conference, Kluwers Academics Publishers (pp. 249-264).
Leont'ev, A. N. (1978). *Activity, consciousness, and personality*. Englewood Cliffs: Prentice Hall.
Leont'ev, A. N. (1981). *Problems of the development of mind*. Moscow: Progress.
Leont'ev, A. N. (2009). *Activity and consciousness*. Retrieved January 14, 2014, from http://www.marxists.org/archive/leontev/works/activity-consciousness.pdf.
Lobel, M., Swedburg, R., & Neubauer, M. (2002). The eClassroom used as a teacher's training laboratory to measure the impact of group facilitation on attending, participation, interaction, and involvement. *International Review of Research in Open and Distance Learning, 3*(2).
Luppicini, R. (2007). Review of computer mediated communication research for education. *Instructional Science, 35*(2), 141-185.
Miller, C. (1984). Genre as social action. *Quarterly Journal of Speech, 70*, 161-167.
Resta, P., & Laferrière, T. (2007). Technology in support of collaborative learning. *Educational Psychology Review, 19*(1), 65-83.
Tolmie, A., & Boyle, J. (2000). Factors influencing the success of computer mediated communication (CMC) environments in university teaching: A review and case study. *Computers & Education, 34*(2), 119-140.
Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner & E. souberman, Trans.). Cambridge, MA: Harvard University Press.
Vygotsky, L. S. (1986). *Thought and language* (A. Kozulin, Trans.). Cambridge, MA: MIT Press.
Wertsch, J. (1998). *Mind as action*. New York: Oxford University Press.

Using Technology in the Classroom: A Study with Turkish Pre-Service EFL Teachers

Assist. Prof. Dr. Ali Merç
Department of Foreign Languages Teacher Education
Anadolu University
Turkey
amerc@anadolu.edu.tr

ABSTRACT
The purpose of this study is to investigate the student teachers' use of technology in their classrooms during practice teaching experience. To this end, a questionnaire was given to 86 student teachers completing their teaching practicum at Anadolu University English Language Teaching Program. Semi-structured interviews were also conducted with 12 of the participants for data triangulation. The analyses of the quantitative and qualitative data indicated that the practicum schools were not very rich in terms of the technological devices available to the student teachers for their EFL classes. It was also discovered that student teachers were not benefiting from technology available to them in their teaching practice at a satisfying level. Insufficient training, lack of basic facilities in the practicum schools, and student teachers' own choices were found the main reasons for student teachers to utilize technology in the teaching practice process. The findings of the study revealed a mismatch between teacher training programs and real-world classrooms in terms of technology integration in EFL instruction. Pedagogical implications of the study consist of the need for better integration of technology in EFL teacher training and a stronger link between the placement schools and the university.

INTRODUCTION
"The use of technology in teaching becomes more important in present times, because teachers also have to be able to keep up with the technological knowledge of their students" (Richards, 2014, p. 2) in order to meet the expectations of today's 'digital natives', who are quite competent, and in a way, dependent to computers and other online instruments (Prensky, 2001). Moreover, the use of technology for teaching, learning, practicing and assessing foreign language has many advantages, particularly in the English as a Foreign Language (EFL) contexts where learners have very few opportunities to practice and assess their language skills. (Alsied & Pathan, 2013). The use of technology in instructional activities also plays an essential role for engaging students in learning (Günüç & Kuzu, 2014).

With the improvements in technology and its use in EFL classrooms, the roles of the EFL teachers are also changing (Zhu & Wang, 2006). Within this change, the knowledge of technology use is a must for foreign language teacher candidates in many teacher training programs (Barzaq, 2007) and for the pedagogical knowledge of both in-service teachers (Chiang, 2003) and teacher educators (Moradkhani, Akbari, Ghafar Samar, & Kiany, 2013). It is even cited as one of the EFL teaching practice assessment criteria (Canh, 2014). Language teachers' handiness to use technology is also mentioned amongst the effective teacher characteristics in higher education (Kourieos & Evripidou, 2013). Besides, the aim of professional development is seen as helping teachers make meaning of technology integration in teaching to regulate its influence on education (Barzaq, 2007).

As for the reasons to integrate technology in foreign language classrooms, Lam (2000) advocates that language teachers use technology because it submits an altered manner of demonstration and offers a kind of enthusiasm for students; not because of a lack of knowledge about teaching with technology, but due to a lack of contact with technology. As one of the most popular technological aids in the classroom, the use of PowerPoint presentations can suggest chances for integrating "colorful texts, photographs, illustrations, drawings, tables, graphs, movies, and transition from one to another through a slide Show" (Alkash & Al-Dersi, 2013, p. 14). Interactive White Board use is also suggested in foreign language teacher education programs to facilitate student engagement (Çelik, 2014).

As a matter of fact, EFL teachers perceived technology use very beneficial in many research and teaching contexts. For example, teachers in Iran had positive attitudes toward using technology to augment language learning through a computer-oriented instruction (Mollaei & Riasati, 2013). In the same vein, there was a positive correlation between a teacher's presence during a computer use and a Computer Assisted Language Learning (CALL) training and a positive attitude toward the use of Information and Communication Technologies (ICT), methodologies in learning in the Saudi classrooms (Alshumaimeri, 2008). Moreover, in a single-subject study, (Jebril, 2012) documented that a Palestinian EFL teacher had very few instructional problems in adapting and implementing ICT, and that the participant teacher revealed a high level of educational

growth through the ICT-intervention practice. In addition, teachers' beliefs about the nature of knowledge and learning and beliefs about effective ways of teaching were in correlation with their technology integration practices. (Kim, Kim, Lee, Spector, & DeMeester, 2013). Furthermore, Korean EFL teachers were found to be seeing computer technology as a useful teaching tool that could easily boost means of teaching by providing students with a variety of language inputs and increasing students' learning capabilities in real-life contexts (Park & Son, 2009). Lastly, the advantages of using the Internet in the EFL classroom were listed as providing authentic materials for learners, making students meet native friends online, and assisting teacher-student communication (Chong, 2001). According to Shin and Son (2007), teachers' individual interest in Internet use, teachers' skills at incorporating Internet resources in classroom tasks, and computer amenities and technical support in schools were the three key factors influencing the Internet use in the foreign language classroom.

Although teachers had positive attitudes towards integrating technology in teaching EFL students, a number of challenges have also been quoted. For example, Chinese EFL teachers used technology chiefly for teacher-centred drives, such as instructional supply, and rarely utilized technology for student-centred tasks. Reasons limiting student-centred technological use in early EFL instruction were teacher-centred experiences in education and lack of operational professional growth that emphasized instructional planning and technology integration (Ni, 2011). Likewise, most of the Libyan teachers confronted difficulties related to time restrictions and lack of managerial support (Emhamed & Krishnan, 2011). Iranian EFL teachers were also found to be suffering from some complications in employing CALL in language classrooms because of the teachers themselves, facilities to use, learners (Hedayati & Marandi, 2014), lack of online services and resources, lack of interface in online teaching, cultural oppositions to online teaching, teachers' inadequate knowledge of online teaching (Dashtestani, 2014), incorporating technology in their teaching successfully because of instructors' self-confidence to utilize technological aids, seeing them as a waste of time, suffering from technophobia, and lack of technological devices that can be used for teaching (Kazemi & Narafshan, 2014). Finally, using the Internet in EFL classes also brought some disadvantages as it required ample time to get the accurate information, and as it was not easy to assess the Internet resources for the EFL classes (Chong, 2001).

Age was also found as a variable in technology integration in foreign language classrooms. According to Rahimi and Yadollahi (2010), a lower technology anxiety had resulted better integration of technology in EFL classrooms; and as older teachers had higher levels of technology anxiety than younger teachers, they were more hesitant to incorporate technology into their classes. It is also reported that external factors such as time constraints, inadequate technology, inflexible school programs and textbooks, and lack of managerial care affect the execution of CALL in a negative way. On the other hand, internal factors such as teachers' inadequacy in technology use, technological knowledge, and views on technology integration also influence teachers' choices to use technology in their classrooms (Park & Son, 2009).

In Turkey, in-service teachers have become the research interest in terms of their technology integration in the practice teaching environments. Erişti, Kurt, and Dindar (2012) found out that inadequacy of the personnel to assist teachers for technology, failure to give them the necessary help at the right time when needed, deficiency in sub-structure, physical setting, the quality of teachers' effectiveness in use of technology, and lack of satisfactory amount of time in the course of becoming competent in technology use are among the challenges that deter teachers' technology use in their classrooms.

Besides the above-mentioned investigation in the non-EFL Turkish training contexts, there have been a number of attempts to look closer at the technology integration in in-service EFL teaching contexts in Turkey. To illustrate, Sağlam and Sert (2012) found that teachers had positive views about the role of educational technology for improving language teaching. Nevertheless, they also acknowledged the problems experienced called for a requisite for a technology integration training for both teachers and students. It is concluded that EFL teachers benefit from technology for teaching academic and linguistic skills, inspiring students to build knowledge, exposing them to life-long learning skills and strategies, teaching students with diverse learning styles, finding and creating teaching materials, developing skills via the on-line sources, and creating an appealing context for learning. In another study, it was found that Turkish EFL teachers had little knowledge about on-line learning resources and has problems relate to the use of software programs. They also complained about a lack of technical and instructional support even if they had positive views about integrating technology into foreign language instruction (Aydın, 2013). In a very recent inquiry, Uluuysal, Demiral, Kurt, and Şahin (2014) investigated the technology integration practices of an EFL teacher in Turkey. The findings revealed that the EFL teacher had positive views about carrying out professional development; she was interested in the process and was conscious about her responsibilities in the process; and that she managed the process along the lines of her own speed to achieve her tasks. Moreover, it was observed that a flexible teaching process was

created; the teacher had positive attitudes towards the process; and that she successfully finished the process creating the instructional materials according to the objective of the professional development task.
Contrary to the present inquires offering that Turkish EFL teachers are often unable and/or unwilling to use technology in their teaching practice, teachers generally expressed that they enjoyed using computerized instructional tackles, saw themselves proficient enough, and believed that they could serve their students easily (Çelik & Aytın, 2014). Besides, teachers were excited and stated that technology could encourage students, augment their learning, and develop their long-term retention when their overall views about the role of technology in language instruction is considered. Even though teachers believed that they had limited training on using technology, they took it as an easy-to-overcome challenge. Contrariwise, lack of access to computers and the Internet was cited as posing an important problem. Also, teachers stated that governmental restrictions on Internet resources restricted their uses whenever they were available to them. Teachers thought that inadequate contact with technology was the main reason constraining the use of technology in the foreign language classrooms. Finally, Başaran (2013) reviewed 10 recent research articles conducted in Turkey related to teachers' and students' opinions about the use of CALL in language teaching. The analyses revealed that students and teachers had positive attitudes towards CALL; nevertheless, the teachers were hesitant to use computers in their classes because of insufficient teacher training on technology and how to employ technology into English teaching process. While the majority of EFL teachers had positive opinions about the potential benefits of CALL, they were not confident enough in trying new technological tools in their teaching. Not only teachers but also students desire their English teachers being more competent to incorporate technological tools in their classes.

As a transition from the in-service context to the pre-service context, we can cite Chung's (2014) current study comparing and contrasting the two groups of teachers on their beliefs about the technology integration in EFL instruction. The results showed that in-service teachers had more positive attitudes about using digital technology in the second language classroom than the pre-service ones despite both groups were generally positive about the matter. Also, the younger participants aged from 21 to 29 were more confident about their expertise in using digital technology. According to the researcher, provided that the teachers are confident and knowledgeable about the use of digital technology, they are more likely to maintain their positive attitudes towards the use of digital technology in the classroom. As a consequence, teachers' classroom practice, experiences with digital technology, technology-related training, context(s) in which such digital technology was used, and their age affected their attitudes towards technology use in the classroom.

Although there were numerous studies regarding the use of technology in foreign language teaching, studies concerning the student teachers' experiences with technology integration is rather limited. In one attempt, Kuo's (2008) study with Taiwanese EFL teacher candidates showed that that most of EFL student teachers had positive experiences and attitudes toward the use of Internet-assisted language instruction and saw technology as a vital method in their future teaching careers. However, approximately one fourth of EFL student teachers did not possess the sufficient levels of confidence and were unsure whether they had the skills and knowledge of technology to integrate technology into their future EFL classrooms. In a similar point of view, Schmid and Hegelheimer's (2014) findings after the analyses of the qualitative data that came from both pre-service and in-service teachers suggested that the field experiences accompanied by systematic guided reflection helped student teachers gain experience in implementing CALL in their teaching. According to the researchers, student teachers reported that school-based experiences helped them in those three ways: using technology in authentic language teaching contexts, assessing the effect of technology on language teaching and learning, and achieving genuine mastery experiences.

In addition to the teacher training contexts worldwide, there are some, but limited, attempts to look closer at the technology integration in pre-service EFL teaching in the Turkish settings recently. In one study, Savaş (2012) listed the advantages of using digital video-recording in micro-teaching practices as being a self-evaluation and self-correction tool, increasing student teachers' self-confidence, refining their English speaking skills, providing a better analysis of the lesson plans, and accumulative collaboration with peers and warranting a fair-minded share of work load. The challenges, on the other hand, were cited as a waste of time for preparing videos, anxiety of video-recording, and difficulty in speaking in English in prep-videos. In a similar vein, Başöz and Çubukçu (2014) recently itemized the positive and negative perceptions of student EFL teachers about CALL. As the pluses, they believe that CALL creates a more comfortable and stress-free air; it is as valued as traditional language learning; it gives flexibility to language learning; it is a good extension of classical learning methods. Student teachers also believe that use of computers in learning a foreign language can improve their vocabulary knowledge and listening skills, and can augment their intelligence. As the minuses, on the other hand, student teachers think that CALL does not help them develop their writing skills; computer use is not as valuable as oral practice; and computers need to be accompanied by other methods in foreign language learning.

In another study with 200 TEFL certificate students in a Turkish university, Yüksel and Kavanoz (2011) found out that teacher candidates' attitudes towards technology were quite positive; these findings were related to the fact that the student teachers were given the necessary technological tools at different periods of their education. Moreover, while female student teachers had more negative attitudes towards technology, type of university and the attitudes were not found to be correlated with each other. In a very recent inquiry, Savaş (2014) focused on the usefulness of Tablet PCs as instructional tools in EFL classes. The findings revealed that prospective teachers could develop more positive attitudes toward the use of Tablet PCs in EFL teaching as they gained more experience in using these teaching devices. In another experiment with 124 prospective Turkish EFL teachers in North Cyprus, Hismanoglu (2012a) checked the EFL teachers' attitudes toward ICT integration into language instruction before and after an ICT-interwoven training. According to the findings, prospective EFL teachers' ICT attitudes before and after ICT interwoven training was significantly different to a positive level, which easily put the emphasis on the prominence of inserting more ICT-related courses in the existing EFL teacher education program.

Hismanoglu and Hismanoglu (2011) and Hismanoglu (2012b) examined the concept from a distance education perspective as well. While the general ICT attitudes of pre-service EFL teachers at the face-to-face higher education context were positive, most of those pre-service EFL teachers at distance higher education context showed more negative attitudes toward ICT integration in teaching (Hismanoglu & Hismanoglu, 2011). Furthermore, student teachers at the Distant English Language Teaching Program in Turkey specified three complications for ICT integration in their foreign language teaching experiences as the lack of exposure to lessons fully designed with ICT-integration, an exam-based system, and exam-oriented study habits (Hismanoglu, 2012b).

Significance of the Study and the Research Questions

Many of the studies reviewed in both Turkish context and other contexts focus on the beliefs and perceptions of in-service and pre-service teachers regarding technology use in EFL classrooms. This study, on the other hand, concentrates on the actual practices of the student teachers in their practicum experiences in teaching English as a foreign language. Therefore, considering the related literature and the existing teaching practice context, the purpose of this study is to investigate student teachers' use of technology in their classrooms during their teaching practicum. It specifically aims, first of all, to document the availability of the technological facilities in practicum schools and their frequency of use by student teachers. Second, whether or not student teachers benefited from technology in the desired level is focused. To this end, the following research questions were formed:

1. Are practicum schools equipped with necessary technological devices available to student teachers' use?
2. How frequently do student teachers use the available technology in their teaching practice?
3. Do they use technology in a satisfying level in terms of quantity and quality? If not, what are the reasons for this?

METHODOLOGY

Participants

The participants of the study were 86 student teachers (62 female 24 male) studying English Language Teaching at Anadolu University. The student teachers were completing their 'Teaching Practicum' and course as a part of their graduation requirement in 2012-2013 Spring Semester. Each of them was assigned to a practicum school for 6 class hours a week. They were also assigned a cooperating teacher and a university supervisor. The student teachers worked in groups of three and with their assigned cooperating teacher for twelve weeks. The first two weeks of the practicum were allocated for observation. After two weeks, each student teacher taught for 10 teaching hours throughout the teaching practicum.

As for the training that student teachers got related to the use of technology in teaching, one compulsory course in their 3rd grade can be referred to. The course 'Instructional Technologies and Materials Development (4 ECTS)' aims to equip all teacher candidates from different disciplines for an awareness to find out about the technological devices in teaching without a specific focus on integrating technology into foreign language teaching. Apart from this formal training opportunity, student teachers are supposed to improve themselves on technology with the help of their observations of their teachers, presentations they give, or informal training opportunities they will create for themselves.

During the practicum, student teachers were supposed to deliver lessons collaborating with their cooperating teachers by following the existing curricula. Therefore, they did not have the chance to decide to use technological devices in their lessons or not to use them at all. They were not assigned to use technology neither

by their university supervisors nor their cooperating teachers. In contrast to some educational contexts, they were not assessed about their skill in effective use of technological devices in their lessons.

Instruments and Collection of the Data

A questionnaire developed by the researcher peculiar to this study and semi-structured interviews were utilized as the data collection instruments. The data were collected at the end of the practicum process (June 2013) when the student teachers completed their teaching practicum. First, the questionnaires were given; semi-structured interviews were conducted one week later.

The questionnaire consisted of two parts. In the first part, demographic features of the participants such as their age, gender, etc. were elicited. In the second part, both Likert-type and open-ended questions were asked to provide the bases to answer the research questions. Semi-structured interviews, on the other hand, were conducted with 12 randomly selected participants in Turkish, their native language. The interviews aimed to elaborate student teachers' opinions related to the survey items and were tape-recorded within the permission of the interviewees for future transcription. Each interview lasted from 7 to 11 minutes depending on each interviewee's opinions and explanations.

RESULTS

This study employed both quantitative and qualitative data collection tools. The findings are presented in accordance with the questions in the survey and the findings obtained from the interview data.

In response to the first research question, first of all, student teachers' opinions about the usefulness of utilizing technological aids in foreign language teaching were questioned to have a better understanding of their practices. According to the student teachers, it was necessary (33,7%) and even very necessary (66,3%) to integrate technology into foreign language classrooms. Second, the technological tools available to student teachers in the practicum schools were elicited. The results indicated that the practicum schools were not very rich in terms of the technological devices available to the student teachers for use in their English classes (Table 1). For example, almost none of the practicum schools had a language lab (98%), a TV-Video player (95%), or an Overhead Projector (88%) while more than half lacked a smart board (79%), a radio-cassette player (79%), or a computer with or without Internet connection (57% and 7 % respectively). On the other hand, student teachers indicated that most schools (70%) had a projector in the classrooms available for use.

Table 1. Availability of technological tools in practicum schools

	Yes		No	
	N	**%**	**N**	**%**
Language Lab	2	2	84	98
TV-Video Player	4	5	82	95
Overhead Projector	10	12	76	88
Computer (With Internet Connection)	37	43	49	57
Smart Board	18	21	68	79
Radio-Cassette/CD Player	18	21	68	79
Computer (Without Internet Connection)	21	24	65	76
Projector	60	70	26	30

For a better understanding of the availability of the technological facilities, the student teachers were asked about their opinions related to the sufficiency of those tools. Here, there was an inconsistency among the answers: while 44.2% of the student teachers thought the facilities in the schools were insufficient (insufficient = 25.6%; very insufficient = 18.6%), the rest (55.8%) found those facilities sufficient (40.7%) or very sufficient (15.1%). Hence, more than half of the student teachers thought that the practicum schools had enough technological devices for their use.

The qualitative data supported the survey results in terms of the inadequacy of technological devices. Most of the student teachers interviewed complained about the lack and/or inadequacy of the technological tools in their practicum schools. They mentioned:

"There is no projection, no OHP, no computer, etc. I've heard that there was one OHP-like thing, but it's said to be placed in a meeting room kind of a room, we had to go there as a whole class. The only technology was limited to my own laptop and loudspeakers and had a listening class. This was the only thing I did for the sake of technology."

"I just used technology one or twice. And it was just with my own laptop because there was nothing in the school…"

"For example, we couldn't find even a loudspeaker for listening, so I don't think there were things like a projection or something like that."

"Because it [the computer] doesn't work in many classrooms. And there is no Internet connection. I had only one chance and I asked them [the students] listen to a record using my laptop, that's all. But I heard some schools have smart boards, I mean, if we had them, we would, of course, use them in our lessons…"

"Now, technology was broken and not that much. Because of the facilities of the school, they didn't have them in the classrooms. The only things we could benefit were the copy machine and the computer in the teachers' room. We could go there and print out and copy the handouts there. But nothing in the classrooms…"

Additionally, they mostly acknowledged that they would be able to effectively use those facilities if they were given the chance to do so. Some of the ideas from student teachers about how they would benefit from those facilities were as follows:

"I could reflect the pictures I showed the children on the screen, or I could conduct an activity there because I know there are many enjoyable activities in the Internet. At least, I could ask students to do them. They could come one by one and answer on the screen. In my earlier practicum, the teacher was using it like that and students liked it a lot. I also liked it a lot."

"I would use technology for showing a picture, for instance. Or I could use it for 'checking understanding' to show the answers of an activity, they could see them better, I guess. Songs, music, visuals… These can all be implemented via technology, especially for teaching young children…"

"I remember teaching the 6th grades, for example. They are, you know, rather overactive. It could be for teaching with songs, videos, etc. Using visual would be great, especially to reinforce these…"

"There was nothing in the classroom in the name of technology. If there were some, sure I would be using. I mean, instead of showing everything on paper, I would open the screen and show it like that. This is even something, I think. You know, when you show a picture to the whole class, some can see well, some cannot; you need to do it part by part. And one more thing: If there was a computer with Internet connection, as the teacher, it would be an advantage for me. I could check if I am not sure about something, pronouncing a word, meaning of a word, etc."

In order to find out the frequency of use of the technological devices available to the student teachers, an explicit question was asked: 'How often have you used the technological facilities throughout your teaching practicum?' The answers to the question yielded the following results: While few of the student teachers indicated that they never used technology (14%), some mentioned that they seldom (20.9%) or sometimes (22.1%) benefited from technological facilities. On the other hand, almost half of the student teachers reported using technology quite frequently (24.4%) or at all times (18.6%). To have a clearer picture of the issue, student teachers were asked to mention the type of technology they used together with their frequency of use. As Table 2 shows, student teachers indicated no use of OHPs (98.8%), a language lab (97.7%), a TV-Video Player (89.6%), a Radio-Cassette/CD Player (84.9%), or a smart board (82.5%), which were already not present in their practicum schools, throughout their teaching practicum process. Among the present devices, the projector was never (48.8%) used or used occasionally (15.1%) by the student teachers. Computers available to the student teachers in the classrooms with or without the Internet connection were either never used (59.3% and 60.6% respectively) or used sparingly (18.6% and 23.2% respectively) in teaching practice. This signposted that student teachers were not benefiting from the technology either because they were not present or because they did not use for any reason.

Table 2. Frequency of use of the technological facilities throughout the practicum

	Never		**1-2 Times**		**3-4 Times**		**5 times +**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Overhead Projector	85	98,8	1	1,2	-	0	-	0		
Language Lab	84	97,7	2	2,3	-	0	-	0	86	100
Radio-Cassette/CD Player	73	84,9	10	11,6	2,3	0	1	1,2		

TV-Video Player	77	89,6	4	4,6	4	4,6	1	1,2
Smart Board	71	82,5	1	1,2	2	2,3	12	14,0
Computer (Without Internet Connection)	52	60,6	20	23,2	4	4,6	10	11,6
Computer (With Internet Connection)	51	59,3	16	18,6	8	9,3	11	12,8
Projector	42	48,8	13	15,1	17	19,8	14	16,3

Although the numbers in Table 2 indicated a low frequency of use, student teachers were still asked to indicate if they benefited from technological facilities in the desired level during their teaching practicum. While 38.4% of them said they did, 12.8% of them were not sure about it, and almost half of them (48.8%) confessed that they did not benefit from them at a satisfying level. As for the reasons for not profiting from technology, 53 of the 86 student teachers, who mentioned not using the technology enough, checked some reasons on the questionnaire by checking more than one item if possible (Table 3). According to the survey results, most students suffered from the lack of basic facilities in the practicum school while very few mentioned insufficient training about technology use, students' not preferring it, or their cooperating teachers' reluctance. None of them indicated it as their supervisor's choice whereas one third reported the reason as their own choice.

Table 3. The reasons for student teachers' not benefiting from technological devices at a satisfying level

Reason	N	%
Lack of basic facilities in the practicum school	41	59,5
My choice	22	31,9
Insufficient Training	4	5,8
Students' dissatisfaction	1	1,4
Cooperating teacher's choice	1	1,4
University supervisor's choice	0	0
Total	69	100

Deviating from the majority, some student teachers believed that they were using technology very effectively in their teaching. For example, one student teachers explained how technology was helpful for him as follows:

"We used almost all of the facilities. We could use the copy machine, take printouts, like that. My 4th grade class was rather crowded, I had 38 pupils. Projection became a blessing for us because if I got a colorful printout, not everyone would see it, but with the projection, it was easy. Also, when you open the projection, their eyes are wide open: I 'm able to take their attention easily."

"I used all like that. I did my listening tasks using the loudspeakers; if the task requires a video, even in mp3 format first, than asking them to watch the video. So I tried to make things more meaningful for the pupils…"

As an attempt for a deeper understanding of the reasons for not benefiting from technology in a satisfying level for teaching English in teaching practicum, student teachers' answers to some questions in the survey were analyzed. The interview data, similar to the survey results, suggested some reasons for student teachers' not benefiting from technological devices in their classrooms at a satisfying level.

First of all, student teachers' ideas about their training at the university about using the technological facilities in foreign language classrooms were elicited. The results indicated that most student teachers perceived the training they got sufficient (55.8%) or very sufficient (15.1%). Some student teachers, on the other hand, found the training insufficient (23.3%) or very insufficient (15.1%). The qualitative data also supported these findings. Student teachers were not very consistent about the adequacy of the training they got during their teacher training education. For example, one student teacher was complaining about the insufficient training on integrating technology into foreign language teaching:

"I've got both personal reasons and limited exposure, I mean, they don't teach us to use videos or listening things…"

"We must get more technical knowledge. For example, we had some classes here, but I don't think they are enough. I can't interrupt easily when necessary, sometimes even I cannot turn on or turn off the computer, sometimes I ask help from students. And when I do this, then it causes me to lose the control of the class."

"For example, I have never taught in a class with a smart board. So, even if there was one in my school, I wouldn't be able to use it effectively."

"I don't think we got a good education about this. We know all these only from our own PowerPoint presentations we prepared for our own presentations. We were never taught like 'It's used like this, you must be careful about this, etc. I've heard from my friends that they had a smart board in their classrooms in the practicum schools last semester, and they really had hard times using it. The same would be for us, too. I heard that students in the class helped them use it. What a shame! Now we don't have them, but what if I'm appointed to a school with all those technological facilities?"

"In fact, we had a 'Computer' lesson in the first year, but it was really nonsense, not enough at all."

Some other student teachers mentioned that they had to find other ways to improve their skills in technology use for foreign language teaching purposes as they found the training as insufficient:

"I was trained abroad for the high school and I was taught there, and my father had sent me to a few courses about computer programs."

"I didn't learn it at school. It was not taught as how 'Microsoft Office' is sed. I just learned it by doing by myself. I prepared presentations for myself, for my lessons, especially for the presentations to take teachers' attention. So I improved myself in that way."

"I just attended a computer course, I learned there, not at university. We didn't learn them there."

Second, they were questioned about the use of technology by their cooperating teachers, who were supposed to mentor them throughout their practice process. The analysis showed that 34.9% of the cooperating teachers were not using technology in their classrooms at all. Some of them were reported rarely (25.6%) and sometimes (19.8%) benefiting from technology while 14% were found to be using technology in teaching English quite often. Only 5.8% of them were always utilizing technological tools in their teaching. One student teacher explained the reasons for cooperating teachers' not using technology as not having the facilities in the schools as follows:

"They don't use it because they don't have it. I'm sure they can use it because they were easily able to help us with the copy machine or the computer when we experienced problems with them. And if they use, I'm sure they will be very successful."

DISCUSSION AND CONCLUSIONS

As the first finding of this study, student teachers in this study reported the usefulness of using technology in foreign language classrooms. The findings are in line with the previous research in various in-service (Alshumaimeri, 2008; Chung, 2014; Jebril, 2012; Kim et al., 2013; Mollaei & Riasati, 2013; Park & Son, 2009) and pre-service contexts worldwide (Chung, 2014; Kuo, 2008; Schmid & Hegelheimer, 2014). The findings also agree with the previous research on in-service (Çelik & Aytın, 2014; Sağlam & Sert, 2012; Uluuysal et al., 2014) and pre-service (Başöz & Çubukçu, 2014; Hismanoglu, 2012a; Savaş, 2012; Savaş, 2014; Yüksel & Kavanoz, 2011) teachers in Turkey. The study has not revealed unexpected results as technology is now in the agenda of all teachers in order to keep up with the modern practices. Teachers also know that they need technology to serve those digital natives in a more meaningful and comprehensive way.

Another finding obtained from both quantitative and qualitative data sources, the practicum schools were found to be poor in terms of providing student teachers with the necessary technological equipment for use in foreign language instruction. Student teachers and in-service teachers in the previous recent studies also complained about the lack of these tools (Aydın, 2013; Çelik & Aytın, 2014; Dashtestani, 2014; Hismanoglu, 2012b; Kazemi & Narafshan, 2014). It is easy to come to a conclusion that this lack and/or inadequacy of those facilities was the key reason for both student teachers and their cooperating teachers for not benefiting from technology in their EFL classes at a satisfying level. One point should be made clear in this discussion that those student teachers were mostly very eager to implement technology-based classroom activities if they had the chance to do so. During the interviews, the majority of the student teachers stated that they would integrate technology into their classroom practices. They would not only gain experience about the how-to-use perspective, but also support their teaching with several technology-aided classroom tasks. It is now known that technology-integration not only enhances student learning but also increases student teachers' self-confidence and help them cultivate their skills in English as a foreign language (Savaş, 2012).

This study also showed that student teachers were not benefiting from technology available to them in their teaching practice at a desired level. The cooperating teachers were also very poor in terms of benefiting from technological aids in the EFL classrooms. As all parties in teacher training would accept, the cooperating teachers are supposed to be good role-models for student teachers. Student teachers really expect support and a positive role-modelling from their mentors for integrating technology into their teaching (Hudson & Nguyen, 2008) as well as employing a communicative approach to their language teaching practices (Zhang, 2013). Therefore, cooperating teachers should work as mentors to the student teachers not only in teaching skills and strategies, but as effective technology users.

In point of fact, cooperating teacher effect is not the only reason. According to Liu (2011), teachers prefer lecturing to using more constructivist practices with technology despite many of them favored learner-centered instruction. There is no doubt that an open and caring milieu is necessary to exploit student teachers' practices during the teaching practicum in order to alter their beliefs and to endorse their cognitive development (Yuan & Lee, 2014). Furthermore, having a high level of language proficiency as well as a certain level of technological knowledge is a need for the use of technology in the EFL classroom; therefore, teacher education programs should offer English language teachers more opportunities for refining their language competence with a specific focus on their oral skills (Kourieos & Evripidou, 2013). Student teachers should not be criticized a lot as they are only at the beginning of their career as teachers considering the fact that they could develop more positive attitude toward technology use in EFL teaching as they expand their experience in using the instructional tools (Savaş, 2014).

The final finding of the study indicated that student teachers were not utilizing technological aids for particular reasons. Not being familiar with certain technological devices or not possessing the necessary knowledge about teaching English via technology just like the teachers in Lam (2000)'s study, were among those reasons. Although a certain proportion of the student teachers found their training at the university about using the technological facilities in foreign language classrooms sufficient, within an ambition to reach a 100% satisfaction level, the training student teachers are provided with on the use of technology in EFL teaching is worth discussing. As one student teacher explains during the interviews, foreign language teacher training programs, must have courses tailored to the needs of the EFL learners, in which they could learn the theoretical background about technology in English classrooms as well as practice opportunities for developing materials, presenting language items such as vocabulary and grammar, and practicing language skills, especially listening comprehension skills. She said:

"It's not something that teachers can learn it [technology] by themselves. They must, first, be interested in it. If they are not interested, then they have to learn it because every teacher has to know about it. I know that all schools in future will be equipped with technological tools, especially smart boards, so all teacher candidates must be provided with the necessary knowledge about technology integration in teaching English.

As the student teacher explained, all schools will possess the necessary technological aids in near future. However, those teachers will not be ready to integrate that technology into their classrooms as they did not have the necessary know-how related to the different aspects of ICT, CALL, mobile learning, and so on. According to Başal (2013), practical knowledge about material development for online courses is the missing part of ELT departments training English language teachers. In agreement with this idea, this study was sufficient to document the existing mismatch between teacher training and the needs of the real world."

Suggestions and Implications

The findings of the study is able to provide some suggestions for student teachers, cooperating teachers, and university supervisors for the integration of technology in EFL teaching and some implications for teacher training programs and practicum schools for a better practicum placement for the student teachers and a more fruitful learning for the students.

First of all, the pedagogical instruction in the higher education institutions should learn some lessons. In other words, EFL teacher training programs should revise their existing program and give their all effort to supplement a technology-integration training in the current curriculum. Barzaq (2007) recommends EFL teacher education programs for an improvement in technology education that they "develop the faculties of education in alignment with up-to-date modern developments, and requirements, so as to accommodate recent changes and digital uses in the educational process (p. 218); they "adapt educational technology to emphasize the e-learning projects, to elaborate the online learning as well, train student- teachers on technological applications and add the computer technology as mandate requirement" (p. 219). Also, EFL teacher candidates should be trained as online material

developers (Başal, 2013) for a better technology integration. One must not forget that increasing pre-service teachers' contact, training, and acquaintance to technology will help them enhance their self-efficacy, motivation, and computing habits (Robertson & Al-Zahrani, 2012). This can be done either by adding technology in the courses where language teaching methodology is taught. Another option can be to provide students, who are the future EFL teachers, with elective courses specifically designed to teach English through technology.

Second, practicum schools and universities should work in cooperation for a technology integration because student teachers think that technology-rich practicum opportunities strengthen the improvement of essential technology-related skills (Schmid & Hegelheimer, 2014). For example, Murphy, Richards, Lewis, and Carman (2005) proposes a Teacher Inquiry Group (TIG) involving a group of classroom teachers and other school and district personnel, together with teacher education faculty members meeting to work on, share, and extend best practices for incorporating technology into classrooms. Payant (2014), on the other hand, recommends the use of video recordings to discover pre-service teachers' identities as teachers, and their pedagogical and practical knowledge bases. Finally, beliefs of student teachers about the nature of knowledge and learning should be taken into consideration so as to enable technology integration as these beliefs could be a preliminary argument to deal with the obstacles to technology integration (Kim et al., 2013).

REFERENCES

Alkash, K. A. M., & Al-Dersi, Z. E. M. (2013). Advantages of using PowerPoint presentation in EFL classroom & the status of its use in Sebha University. *IJ-ELTS*, *1*(1), 3-16.

Alshumaimeri, Y. A. (2008). Perceptions and attitudes toward using CALL in English classrooms among Saudi secondary EFL teachers. *The JALT CALL Journal*, *44*(2), 29-66.

Alsied, S. M., & Pathan, M. M. (2013). The use of computer technology in EFL classroom: advantages and implications. *IJ-ELTS*, *1(1)*, 61-71.

Aydin, S. (2013). Teachers' perceptions about the use of computers in EFL teaching and learning: the case of Turkey. *Computer Assisted Language Learning*, *26*(3), 214-233. http://dx.doi.org/10.1080/09588221.2012.654495

Barzaq, M. Y. (2007). *Student-teachers' training programmes evaluation in English Language Teaching Colleges of Education in Gaza Strip universities*. Unpublished Master's Thesis. The Islamic University, Gaza.

Başal, A. (2013). ELT teachers as online material developers. *The Online Journal of Distance Education and e-Learning*, 1(2), 8-12. http://www.tojdel.net/volume01-issue02.php

Bas aran, B. C. (2013). Attitudes of EFL teachers and learners towards CALL in Turkey. In Proceedings of the *International Conference ICT for Language Learning* (6th Ed.), Florence, Italy. Retrieved from http://conference.pixel-online.net/ICT4LL2013/conferenceproceedings.php

Başöz, T., & Çubukçu, F. (2014). Pre-service EFL teacher's attitudes towards Computer Assisted Language Learning (CALL). *Procedia-Social and Behavioral Sciences*, *116*, 531-535. http://dx.doi.org/10.1016/j.sbspro.2014.01.253

Canh, L. V. (2014). Great Expectations: The TESOL practicum as a professional learning experience. *TESOL Journal*, *5*(2), 199-224. http://dx.doi.org/10.1002/tesj.103

Chong, D. H. (2001). The practical considerations of the Internet in the EFL classroom. *The Journal of Multimedia-Assisted Language Learning*, *3*(2), 9-35.

Chung, S. (2014). *Pre-service and in-service ESL teachers' beliefs about the use of digital technology in the classroom*. Unpublished MA Thesis. Carleton University, Ottawa, Ontario.

Çelik, S. (2014). Exploring IWB use for Language Instruction in Turkish Higher Education Settings In E. Cutrim Schmid & S. Whyte (Eds.), *Teaching languages with technology: communicative approaches to interactive whiteboard use. A resource book for teacher development.* London: Bloomsbury.

Dashtestani, R. (2014). English as a foreign language—teachers' perspectives on implementing online instruction in the Iranian EFL context. *Research in Learning Technology*, *22*. http://dx.doi.org/10.3402/rlt.v22.20142

Dias, I. C. B., & Bocorny, A. E. P. (2014). Perceptions and perspectives on internet assisted language teaching by English teachers from Rio Grande do Sul. Revisto *Entrelinhas*, *8*(1), 46-57.

Emhamed, E. D. H., & Krishnan, K. S. D. (2011). Investigating Libyan teachers' attitude towards integrating technology in teaching English in Sebha secondary schools. *Academic Research International*, *1*(3), 182-192.

Hedayati, H., & Marandi, S. S. (2014). Iranian EFL teachers' perceptions of the difficulties of implementing CALL. *ReCALL*, *26*, 298-314. http://dx.doi.org/10.1017/S0958344014000172

Hismanoglu, M. (2012a). The impact of a curricular innovation on prospective EFL teachers' attitudes towards ICT integration into language instruction. *International Journal of Instruction*, *5*(1), 183-202.

Hismanoglu, M. (2012b). Prospective EFL teachers' perceptions of ICT integration: A study of Distance Higher Education in Turkey. *Educational Technology & Society*, *15*(1), 185-196.
Hismanoglu, M., & Hismanoglu, S. (2011). Attitudes of English teacher candidates toward ICT. *E-International Journal of Educational Research*, *2*(2), 17-29. http://dx.doi.org/10.1080/09588221.2012.654495
Hudson, P. B., & Nguyen, T. M. H. (2008). *What do preservice EFL teachers expect from their mentors?* Paper presented at Australian Association of Research in Education (AARE) Conference 2008, 30th November - 4th December, 2008, Brisbane. Retrieved from http://eprints.qut.edu.au/
Jebril, W. A. (2012). *The viability of Palestinian EFL teachers to effectively apply ICT as an educational medium in Palestinian basic schools in the Gaza Strip: A pedagogical perspective*. Unpublished M.S. thesis. State University of New York at Albany. Retrieved from http://search.proquest.com/docview/1019244031?accountid=7181
Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education*, *29*, 76-85. http://dx.doi.org/10.1016/j.tate.2012.08.005
Kourieos, S., & Evripidou, D. (2013). Students' perceptions of effective EFL teachers in university settings in Cyprus. *English Language Teaching*, *6*(11), 1-16. http://dx.doi.org/10.5539/elt.v6n11p1
Kuo, M. M. (2008). Learner to teacher: EFL student teachers' perceptions on Internet-Assisted Language Learning and Teaching. Online Submission. Education Resources Information Center. ED502217.
Lam, Y. (2000). Technophilia vs. technophobia: A preliminary look at why second-language teachers do or do not use technology in their classrooms. *Canadian Modern Language Review*, *56*(3), 389-420. http://dx.doi.org/10.3138/cmlr.56.3.389
Li, G., & Ni, X. (2011). Primary EFL teachers' technology use in China: Patterns and perceptions. *RELC Journal*, *42*(1), 69-85. http://dx.doi.org/10.1177/0033688210390783
Liu, S. H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers and Education, 56(4),* 1012-1022. http://dx.doi.org/10.1016/j.tate.2007.01.002
Mollaei, F., & Riasati, M. J. (2013). Teachers' perceptions of using technology in teaching EFL. *International Journal of Applied Linguistics & English Literature*, *2*(1), 13-22. http://dx.doi.org/10.7575/ijalel.v.2n.1p.13
Moradkhani, S., Akbari, R., Ghafar Samar, R., & Kiany, G. R. (2013). English language teacher educators' pedagogical knowledge base: The macro and micro categories. *Australian Journal of Teacher Education*, *38*(10), 123-141. http://dx.doi.org/10.14221/ajte.2013v38n10.7
Murphy, K., Richards, J., Lewis, C., & Carman, E. (2005). Strengthening educational technology in K-8 urban schools and in preservice teacher education: A practitioner-faculty collaborative process. *Journal of Technology and Teacher Education*, *13*(1), 125-139.
Park, C. N., & Son, J. B. (2009). Implementing computer-assisted language learning in the EFL classroom: Teachers' perceptions and perspectives. *International Journal of Pedagogies and Learning*, *5*(2), 80-101. http://dx.doi.org/10.5172/ijpl.5.2.80
Payant, C. (2014). Incorporating video-mediated reflective tasks in MATESOL Programs. *TESL Canada Journal*, *31*(2), 1-21.
Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9 (5),* 1-6. http://dx.doi.org/10.1108/10748120110424843
Rahimi, M., & Yadollahi, S. (2011). Computer anxiety and ICT integration in English classes among Iranian EFL teachers. *Procedia Computer Science*, *3*, 203-209. http://dx.doi.org/10.1016/j.procs.2010.12.034
Richards, J. C. (2014). Foreword. In J. D. D. M. Agudo, (Ed.). *English as a foreign language teacher education: Current perspectives and challenges* (pp. 1-3). Amsterdam: Rodopi.
Robertson, M., & Al-Zahrani, A. (2012). Self-efficacy and ICT integration into initial teacher education in Saudi Arabia: Matching policy with practice. *Australasian Journal of Educational Technology*, 28(7), 1136-1151. Retrieved from http://www.ascilite.org.au/ajet/ajet28/robertson.html
Savas, P. (2014). Tablet PCs as instructional tools in English as a Foreign Language education. *TOJET*, *13*(1), 217-222. Retrieved from http://www.tojet.net
Savaş, P. (2012). Use of digital video recording in the preparation stage of pre-service foreign language teachers' micro-teachings. *International Journal on New Trends in Education and Their Implications*, 3(3), 107-116.
Shin, H. J., & Son, J. B. (2007). EFL teachers' perceptions and perspectives on internet assisted language teaching. *Computer-Assisted Language Learning Electronic Journal (CALL-EJ)*, *8*(2). Retrieved from http://callej.org/journal/8-2/h-js_j-bs.html
Uluuysal, B., Demiral, S., Kurt, A. A., & Şahin, Y. L. (2014). A technology integration journey of a teacher. *TOJQI*, *5*(4), 12-22. Retrieved from http://www.tojqi.net
Yuan, R., & Lee, I. (2014). Pre-service teachers' changing beliefs in the teaching practicum: Three cases in an EFL context. *System*, *44*, 1-12. http://dx.doi.org/10.1016/j.system.2014.02.002

Yüksel, G., & Kavanoz, S. (2011). In search of pre-service EFL certificate teachers' attitudes towards technology. *Procedia Computer Science*, *3*, 666-671. http://dx.doi.org/10.1016/j.procs.2010.12.1111

Zhang, H. (2014). *Pre-service Chinese English as a Foreign Language (EFL) teachers' perceptions about implementation of communicative language teaching.* Unpublished Doctoral Dissertation. The University of New Mexico, Albuquerque, New Mexico.

Zhu, S. P., & Wang, H. (2006). Positioning the roles of English teachers in on-line college English teaching. *Journal of Hainan Normal University (Humanities and Social Sciences)*, *3*, 154-156. Retrieved from http://www.oriprobe.com/journals/hnsfxyxb/2006_3.html

NOTES

1. An earlier version of this paper was presented at the "Hong Kong International Conference on Education, Psychology and Society" on December 19-21, 2013 in Hong Kong, PRC.

2. Sample extracts from the interviews were originally Turkish. They were translated into English by the researcher.

Utilization of Information and Communication Technologies as a Predictor of Educational Stress on Secondary School Students

Ahmet Eskicumalı
Sakarya University Sakarya/Turkey
ecumali@sakarya.edu.tr

Serhat Arslan
Sakarya University Sakarya/Turkey
serhatarslan@sakarya.edu.tr

Zeynep Demirtaş
Sakarya University Sakarya/Turkey
zeynept@sakarya.edu.tr

ABSTRACT
The purpose of this study is to examine the relationship between utilization of information and communication technologies and educational stress. Participants were 411 secondary school students. Educational Stress Scale and Utilization of Information and Communication Technologies Scale were used as measures. The relationships between students' educational stress and utilization of information-communication technologies were examined by using correlation analysis and stepwise regression analysis. Educational stress was predicted positively getting information, research, communication, game and self-expression. Results were discussed with respect to the related literature.

Keywords: Educational stress, information and communication technologies, high school students.

INTRODUCTION
Nowadays, the expectation of the society has increased and this has created some undesirable feelings on people. The expectation of the society and family members are perceived as pressure by individuals. Hence, doing something under pressure in order to meet the expectations creates emotional stress. Canon (1914) described stress as cognitive and physical conditions in alarm situations. Moreover, according to Selye (1936), stress is a physical condition characterized by strain and resistance to external stimuli and this situation is called as General Adaptation Syndrome (GAS) (Lazarus and Folkman, 1984). This stress condition that can result in both favorable and unfavorable outcomes affects work, school, and family lives. The relationship with family members and friends affects students' health and happiness (Weber, 2003). Especially in education process in Turkey, family's pressure on students in order to be successful in school life plays a significant role on students and their behaviors. Hence, students deal with academic, personal, and social pressures (Gemmill and Peterson, 2006). These pressures impose students. The source of this can be the use of information technologies. However, if the students have already used the information technologies, and they have been familiar to it, it can be considered as a factor that decreases the pressure. Well then, in which areas information technologies come into students' daily lives? Currently, information technologies have been used by students more than ever before. Information and communication technologies are information technologies that are used in reaching information, storing that information, producing information or making regulations on it, and transmitting this information to wherever we want with the help of networks (Eroğlu and Yazar, 2013). Each visual, auditory, written, and published material, used in acquiring and producing information, builds up information and communication technologies. Information technologies, taking part in every area of our lives, are technologies that enable transmitting information without time, place, and distance (MEB, 2013). Recently, technology has begun to be used in our education system, the information technology classes have been formed in most of the schools, and technology has equipped schools (Eroğlu and Yazar, 2013). The use of technology in education has affected the structure of education system, and thus technology has been used in teaching learning activities. Educational technologies enable students to reach information by acting as a bridge. Therefore, students can acquire information easily. At this point, the important thing is that educational technologies used in teaching- learning process should be appropriate to students' learning skills, and they should be used by students easily (İşman, 2011). What kind of information technologies is used by students and for what purpose? The social networks come first since internet resources have an important role. Obtaining information can be actualized via internet. Students need some technological devices in their daily lives and school environment (Gemmill and Peterson, 2006). Despite the benefits of these devices, psychologists and educationists are aware of the negative effects of them in terms of psychological and physical features (Greenfield, 2000).

Recently, technology use has become a necessity in order to meet the expectation of peers and teachers as well as the society. In addition, students have to use this technology and this situation puts a pressure on students. Students' feeling of deficient and insufficient because of not being able to use technological devices creates some negative outcomes. Besides, several studies show that stress factors are related to individual's psychological conditions, and they have negative effects on health (Pandya, Deshpande and Karani, 2012). Information technologies of which use is difficult or unknown may confront students with negative situations among their peers. Benefiting from information technologies in class environment as a teaching- learning material has a significant effect because these technologies change the teaching process and confront students with unknown technologies (Bitner and Bitner, 2002). Hence, the anxiety related to information technologies has become widespread in academy (Ekizoglu and Ozcinar, 2010; Rahimi and Yadollahi, 2011). As a result of this, students may be unsuccessful in courses or they may dislike courses so that this situation may be one of the reasons of stress. Therefore, not being able to meet the expectation of external factors comes into question (Ang., Klassen, Chong, Huan, Wong, Yeo, and Krawchuk, 2009). Indeed, if individuals have no ability to deal with these expectations, arising of stress will be inevitable (Lazarus, 1966). The current study aims to investigate the relationship between students' educational stress and the level of their information technology use.

The present study

Few studies have connected educational stress with Information and Communication Technologies characteristics (Rahardjo, Juneman ve Setiani, 2013; Fakun, 2009; Gemmil ve Peterson, 2006) and, to our knowledge, no research has been conducted investigating educational stress' relationship to Information and Communication Technologies. Thus, the aim of the present study is to examine the relationship between Utilization of Information and Communication Technologies and Education Stress. In the present research, the educational stress has been considered as an outcome and students' Utilization of Information and Communication Technologies as the predictor. It is hypothesized that students' Utilization of Information and Communication Technologies would be associated positively with educational stress based on the studies on support Information and Communication Technologies (Gemmil and Peterson, 2006; Mark, Wang and Niiya, 2014) and educational stress (Arslan, 2015; Lin, Lin, Wang and Chen, 2009; Rahardjo, Juneman and Setiani, 2013).

METHOD

Participants

Participants were 411 (212 (%51) female and (199 (%49) male secondary school students from Sakarya. Of the participants, 263 (64 %) were seventh grade-students, 148 (36%) were eight grade-students. Their ages ranged from 12 to 14 years old (M = 13.2, SD = .66).

Measures

Educational Stress Scale (ESS). Educational Stress Scale (ESS). The ESS is developed by Sun, Dunne, Hou, and Xu (2011) consists of 16 items (five factor: workload, worry about grades, self-expectation, and despondency) and each item was presented on a 5-point Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree with a higher score indicating greater stress. Turkish adaptation of this scale had been done by Akın, Gediksiz, Arslan, and Akın (2012). They found that internal consistency was .87 for Turkish university students. The goodness of fit index values of the model were RMSEA=.037, NFI=.97, NNFI=.99 , CFI=.99, IFI=.99, RFI=.96, GFI=.95, AGFI=.92 and SRMR=.041. The corrected item-total correlations of ESS ranged from .40 to .60. Factor loadings ranged from .68 to . 95.

The Utilization Of Information And Communication Technologies Scale. The Utilization Of Information and Communication Technologies Scale developed by Özmusul (2011) consists of 18 items and each item was presented on a 4-point Likert type scale ranging from 1= Never to 4= Always. It was determined that the scale had five factors. These factors are acquiring information, research and examination, communication, entertainment-game and self expression. The calculated alpha Cronbach coefficient for the scale was 0.85. A sum of all scores yields a total score that ranges from 4 to 72; a higher score indicates a higher utilization of information and communication technology level.

Procedure

Students voluntarily participated in research, completion of the scales was anonymous and there was a guarantee of confidentiality. The scales were administered to the students in groups in the classrooms. The measures were counterbalanced in administration. Prior to administration of scales, all participants were told about purposes of the study. In this research, Pearson correlation coefficient and multiple regression analysis were utilized to determine the relationships between dimensions of Utilization of Information and Communication Technologies and Educational Stress.

Procedure and Data Analysis

Convenience sampling technique was used in selection of participants. Convenience sampling is a non-probability sampling technique in which participants are selected because of their convenient accessibility and proximity to the researcher (Bryman, 2004). For this reason, the results of this study did not make inference from population which let to decrease external validity. Participants voluntarily participate and are free to fill out questionnaires without pressure. Completion of the questionnaires was anonymous and there was a guarantee of confidentiality. The instruments were administered to the students in groups in the classrooms. The measures were counterbalanced in administration. Prior to administration of measures, all participants were told about purposes of the study. In this research, Pearson correlation coefficient and multiple regression analysis were utilized to determine the relationships between Utilization of Information and Communication Technologies and Educational Stress. These analyses were carried out via SPSS 11.5.

RESULTS

Descriptive Data and Inter-correlations

Table 1 shows the means, standard deviations, inter-correlations, and internal consistency coefficients of the variables used. Preliminary correlation analysis showed that information ($r = .35$), research ($r = .21$), communication ($r = .12$), game ($r = .35$) and Self-expression ($r = .35$) related positively associated with educational stress.

Table 1: Descriptive statistics and inter-correlations of the variables

Variables	Informational	Research	Communication	Game	Self-Expression	Educational S.
Information	—					
Research	.58**	—				
Communication	.40**	.44**	—			
Game	.52**	.40**	.44**	—		
Self-expression	.44**	.41**	.36**	66**	—	
Educational Stress	.35**	.21**	.12**	.35**	35**	—
Mean	48.4	13.1	8.9	14.56	7.5	5.4
Standard deviation	7.4	3.5	2.3	4.0	2.6	1.8

**$p < .01$

Multiple Regression Analysis

Before applying regression, assumptions of multiple regression were checked. The data were examined for normality by the Kolmogorov-Smirnov test. The Kolmogorov-Smirnov test indicated normality of distributions of test scores for all tests in the current study. Outliers are cases that have data values that are very different from the data values for the majority of cases in the data set. Outliers were investigated using Mahalanobis distance. A case is outlier if the probability associated with its D^2 is .001 or less (Tabachnick & Fidell, 2001). Based on this criterion, five data were labeled as outliers and they were deleted. Multi-collinearity was checked by the variance inflation factors (VIF). All the VIF values were less than 10 (Tabachnick & Fidell, 2001), which indicated that there was no multi-collinearity.

Multiple regression analysis have been applied to determine which dimensions of communication technologies were the best predictors of educational stress. Table 2 showed the results of multiple regression analysis where the independent variables were dimensions of between utilization of information and communication technologies and the dependent variable was educational stress.

Table 2: Summary of stepwise multiple regression analysis for variable predicting educational stress

Variables	*B*	SE_B	β	*t*	*p*	*R*	R^2	*F*	*p*
Step 1									
Information	.71	.096	.34	7.4	.00	.34	.120	55.75	.00
Step 2									
Information	.70	.11	.34	5.9	.00	.34	.12	27.82	.00
Research	.03	.17	.01	.17	.86				
Step 3									
Information	.71	.12	.34	5.9	.00	.34	.12	18.5	.00

Research	.05	.18	.01	.29	.77				
Communication	-.04	.09	-.02	-.44	.65				
Step 4									
Information	.50	.12	.24	4.00	.00				
Research	.001	.18	.00	.008	.99	.40	.16	20.3	.00
Communication	-.17	.09	-.09	-1.72	.08				
Game	.73	.15	.26	4.76	.00				
Step 5									
Information	.48	.12	.23	3.8	.00				
Research	-.08	.18	-.02	-.44	.65				
Communication	-.17	.09	-.09	-1.83	.06	.43	.17	.18.6	.00
Game	.43	.18	.15	2.40	.01				
Self-expression	.77	.24	.19	3.14	.00				

*$p < .01$

Information entered the equation first, accounting for 12% of the variance in predicting educational stress. Game entered on the fourth step accounting for an additional 5% variance. The last regression models Information, Research, Communication, Game, and Self-expression as predictors of educational stress and accounted for 18% of the variance in educational stress. The standardized beta coefficients indicated the relative influence of the variables in last model with Information (β= .23, p<.01), Research (β= .02, p<.01), Communication (β= .09, p<.01), Game (β= .15, p<.01), and Self-expression (β= .15, p<.01) all significantly influencing educational stress and information was strongest predictor of educational stress.

DISCUSSION

The present study, aimed to investigate the relationship between students' educational stress and the level of their information technology use, was conducted on the 7th grade students, and results showed that there was a positive relationship between students' educational stress and the level of their information technology use. In other words, when students have to use information technologies their educational stress increases. Rahardjo, Juneman and Setiani (2013) conducted a study on college students in Indonesia and investigated the effect of academic stress and anxiety of computer use and they found similar results. It was found that students who had anxiety due to computer use, and experienced academic stress, procrastinated the necessity of the course which requires computer use. Gemmil and Peterson (2006) carried out a study on university students and indicated that students spent lots of time with technology and related to this, they investigated students' perceived stress level. Indeed, 25% of students had problems related to technology use, and perceived stress level increased in accordance with technology use. Mark, Wang and Niiya (2014) conducted a study on university students and examined the relationship between time spending on computer and stress. In this research, 48 university students in America let using computer for 7 days when students were awake in their natural environment. Students' stress level was measured by biosensors. Thus, they found that there was a positive relationship between time spending on computer and students' stress level. According to Fakun (2009), individuals' anxiety due to computer use affected their perception about the easiness of computer use negatively. Individuals who experienced anxiety had trouble with fulfilling duties which required computer use even if they knew computer use. Lin, Lin, Wang and Chen (2009) carried out a study on students who studied at ten different technology schools, and they investigated the reasons of students' educational stress. Students experienced stress related to their academic problems at technology schools, and they perceived themselves as insufficient to solve these problems. Hence, this made students unhappy and affected their cognitive and physical health negatively. At the end of the study, authors divided students' educational stress reasons in four dimensions: stress related to test scores (the content of tests, test results, and expectations of families), stress related to teachers (the content of course materials, teaching methods and techniques, and assignments), stress because of themselves (expectations about themselves, selection of topics, time management), and stress due to their peers (group works, academic competition, and disappointing behaviors of their classmates). Findings that supported the results pointed out that students' stress due to course materials, teaching methods, and assignments at technology schools were related to technological devices they had to use. Furthermore, according to the study which investigated information technology use on 7th grade students (Tuti, 2005), students preferred mostly the following activities; playing games, downloading music, searching information resources, drawing and painting.

Students benefited information technologies mostly because of doing entertaining activities. Another finding was that students had positive opinions about information technology use in education. Students thought that if teachers use information technologies in teaching, topics will be more interesting and enjoyable. When examined previous researches, students thought that using information technologies for enjoyable activities, and social media in their daily lives decreased their stress. On the other hand, when they had to use information technologies for assignments, they experienced stress and anxiety. This stem from students' troubles in terms of using information technologies. Especially, for 7th grades, they may have problems in terms of having and using information technologies. In fact, maybe students do not know using information technologies effectively. Therefore, when information technology use is necessary for teaching- learning process, students may perceive this as a pressure and they may experience stress. All in all, using information technologies causes educational stress on 7th grades. It can be suggested that in teaching process, applications, seminars, and courses related to students' effective information technology use should be arranged.

REFERENCES

Akın, A., Gediksiz, E., Arslan, S., & Akın, Ü. (2012). The validity and reliability of the Turkish version of educational stress scale for adolescents (ESSA).International Conferences on New Horizons in Eucation, 2-8 Haziran, CzechRepublic/Prague.

Arslan, S. (2015). The Predictive Role of Educational Stress on Social Emotional Learning in Elementary Students. Educational Research and Reviews, 10 (1) 184-190.

Ang, R. P., Klassen, R. M., Chong, W. H., Huan, V. S., Wong, I. Y., Yeo, L. S., & Krawchuk, L. L. (2009). Cross-cultural invariance of the academic expectations stress inventory: adolescent samples from Canada and Singapore. *Journal of Adolescence*, 32 (5), 1225-1237.

Bryman, A. (2004). Social Research Methods (2nd edition). Oxford: Oxford University Press.

Bitner N., & Bitner, J. (2002). Integrating technology into the classroom: eight keys to success. *Technology and Teacher Education 10*, 95-100.

Ekizoglu, N., & Ozcinar, Z. (2010). The relationship between teacher candidates' computer and internet based anxiety and perceived self-efficacy. *Procedia Social and Behavioral Sciences*, 2: 5881-5890.

Eroğlu, E. & Yazar, D. (2013). Ortaöğretim Bilgi ve İletişim Teknolojisi Ders Kitabı. Ankara: Milli Eğitim Bakanlığı Yayınları.

Fakun, D. (2009). How to mitigate the significant negative influence of computer anxiety on ease of use perceptions. *Behaviour & Information Technology*, 28, 223-238.

Gemmill, E. & Peterson, M. (2006). Technology use among college students: implications for student affairs professionals. *NASPA Journal*,43 (2), 280-300.

Greenfield, D. N., (2000). Psychological characteristics of compulsive internet use: A preliminary analysis. *Cyber Psychology & Behavior*, 5, 403-412.

İşman, A. (2011). *Öğretim Teknolojileri ve Materyal Tasarımı*. Ankara: Pegem Akademi Yayınları.

Lazarus, R.S. (1966). *Psychological Stress and the Coping Process.* New York: McGraw-Hill.

Lazarus, R. & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.

Lin, Y. M., Lin, S. C., Eang, M. Y. & Chen, F. S. (2009). What causes the academic stress suffered by students at universities and colleges of technology? http://ir.lib.cyut.edu.tw:8080/bitstream/310901800/9028/1/What%20causes%20the%20academic369.pdf adresinden 24 Eylül 2014 tarihinde indirilmiştir.

Mark, G., Wank, Y. & Niiya, M. (2014). Stress and multitasking in everyday college life: an empirical study of online activity. *CHI 2014*, April 26 - May 01, Toronto, ON, Canada.

MEB, (2013). Bilgi ve İletişim Teknolojileri (BİT) Ürünleri. mebk12.meb.gov.tr/meb_iys_dosyalar/22/01/706462/dosyalar/2013_12/06113759_1.3.1.btrnleri1.3.2.bteitleri.pdf adresinden 25 Ekim 2014 tarihinde indirilmiştir.

Özmusul, M. (2011). Bilişim teknolojilerinden yararlanma ölçeğinin geliştirilmesi. Kuramsal Eğitimbilim, 4(1), 1-17.

Pandya, B. U., Deshpande, M. R. C., & Karani, A. (2012). A Study on Impact of Academic Stress on MBA Students of Gujarat Technological University. *Researcher's World-Journal of Arts, Science and Commerce*, *3*(3).

Rahimi, M., & Yadollahi, S. (2011). Success in learning English as a foreign language as a predictor of computer anxiety. *Procedia Computer Science*, 3, 175-182.

Rahardjo, W., Juneman, Setiani Y. (2013). Computer anxiety, academic stress, and academic procrastination on college students. *Journal of Education and Learning*, 7 (3), 147-152.

Sun, Jiandong, Dunne, Michael P., Hou, Xiang-Yu, & Xu, Ai-qiang (2011).Educational stres scale for adolescents : development, validity, and reliability with Chinese students. Journal of Psychoeducational Assessment, 29(6), 534-546.

Tabachnick, B. G., & Fidell, L. S. (2001). Using Multivariate Statistics. Boston: Allyn and Bacon.

Tuti, S. (2005). Eğitimde Bilişim Teknolojileri Kullanımı Performans Göstergeleri, Öğrenci Görüşleri Ve Öz-Yeterlik Algılarının İncelenmesi. Yayımlanmamış yüksek lisans tezi, Hacettepe Üniversitesi, Fen Bilimleri Enstitüsü, Ankara.

Weber, L. (2003). Relationships among spirituality, social support, and childhood maltreatment in university students. *Counseling and Values,* 47 (2), 82-96.

Web 2.0 in Education: the Impact of Discussion Board on Student Performance and Satisfaction

Mashael Nasser AlJeraisy
Information System Department, Al Imam Mohammad Ibn Saud Islamic University (IMSIU),Riyadh, Saudi Arabia
mashael.n.j@gmail.com

Heba Mohammad
Information System Department, Al Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia
hkmohammad@ccis.imamu.edu.sa

Ayham Fayyoumi
Information System Department, Al Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia
a.fayyoumi@gmail.com

Waleed Alrashideh
Information System Department, Al Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia

ABSTRACT
Web.2 technologies allow people to be the producer of information and this will increase the information in a network. Discussion Boards (forums) are Web.2 technology that enable student to interact, collaborate and exchange knowledge in different online courses. The main objective of this research study is to investigate the impact of Discussion Boards on students' grades and satisfaction with the learning environment. The study compared two groups of similar students studying similar topic and compared the results after 6 weeks experiment. Results showed that there is a positive impact on students' grades and student's satisfaction. Moreover, additional investigations were made to deeply understand the other related impacts that arose during the research study.

INTRODUCTION
One of the main challenges of e-learning is providing methods and tools for interaction that take advantage of technology's unique features, rather than simply attempting to replicate interaction forms that are used in traditional learning (Zhu, 2012). One mode that technology offers is asynchronous interaction, a type of interaction that does not necessitate all students being online at the same point of time. Zhong (2013) points out that, in a traditional classroom, lecturers and students interact while being together in the class, and they study while they are alone outside of their classroom (i.e. home or library). Within a traditional mainstream classroom, asynchronous mingling can happen while individual study is occurring (Comeaux & McKenna-Byington, 2003).
The Web 2.0 originated by O'Reilly (2005) to referring to the modern interactive generation of web-based application services that enable users to create their own content. They are also referred to as user-generated, read-write, social, and interactive web. There has been a recent explosion in Web 2.0 services, which continue to evolve rapidly to anticipate user demand. There are many services with similar functionality availability, which can confuse educators about which one they should use. In such a case, the teacher can use guides to find out which tools provide the best results (Chen *et al*., 2012). With the continued growth and advancement of online courses, there should be an effort to understand more about students' experiences in the online environment.

Research studies that have been conducted into how students fare in online courses versus face-to-face courses; in addition, research has compared students' satisfaction with various course environments. Now, that discussion needs to move towards gaining a better and more holistic understanding of how students learn in courses and what online learning mechanisms help or hinder students' learning and satisfaction in these online courses. More in-depth knowledge in this area can influence the way instructors use online discussion and forums in their courses. Online discussions are often used in traditional and blended classes, so assessing the impact of student outcomes associated with discussion boards could benefit facilitators of traditional and hybrid courses as well. Following is how to utilize Web 2.0 in education.

THE STUDY BACKGROUND
WEB 2.0 IN EDUCATION
Based on the capabilities of Web 2.0, it increases student's motivation to learn. Specifically, through the practical advantages of using Web 2.0 technologies. In fact, they are user friendly and familiar to staff and students. Al-Oqily et al. (2013) claim that the present generation is composed of digital natives, those who can manage information much different than their predecessors. Although, Kurbalija et al. (2004) and many others

had different views previously. Regardless of the debate, it can be said undeniably that, now a days, most young people possess a basic understanding of Web 2.0 tools. Researchers have pointed out that the practice of teaching did not fit 21st century learners (Blackwell et al., 2014). The feeling was that there was too much dependence on imparting knowledge rather than encouraging certain processes of critical thinking. Therefore, Garrison and Anderson called for a rethinking of pedagogy, incorporating the opportunities offered by e-learning.

The capabilities of Web 2.0 platforms provide valuable opportunities for sense-making and processing as well as constructing knowledge and creatively collaborating (Abulibdeh & Syed Hassan, 2011). Mangold and Faulds (2009) have noted that the primary drive of technology adoption is the highly collaborative kind of work that student's desire. E-learning also provides greater independence learner in terms of distance and time at the cost of collaboration opportunities with others (Garrison and Anderson, 2003). However, e-learning now has the capability to support both collaborative and independent learning; inquiry communities can incorporate more discussion of individuals' experiences and ideas (Kietzmann et al., 2011).

There is also need for students to understand that the online profiles and activities are highly visible to potential employers; an individual's digital footprint can be a significant source of information about him or her. Moreover, Web 2.0 might call for new requirements to be met in digital literacy, including skills in presenting and producing multimedia content. This trend calls for renewed attention to creativity in presenting ideas, analyses, and arguments. It should be noted, however, that there is risk of the medium dominating the message (Bennett et al., 2012).

DISCUSSION BOARDS

In online education, threaded discussions or discussion boards are amongst the most frequently- and commonly-used tools. Discussion forums assist in producing asynchronous discussion over a certain time period (Blackmon, 2012). The ability to interact asynchronously is one of the main benefits of online learning. Students can reflect upon their perceptions and ideas before they decide to share them in the class, which leads to better reflective responses as well as deeper learning. A variety of other benefits to using discussion boards have been noted (Song & McNary, 2010):

- They build classroom dynamics by promoting discussion on different course topics.
- They allow students to reflect deeply on course concepts. Students have more time to research, reflect, and compose their thoughts prior to participating in discussions.
- They assist in learning by allowing students to look into and respond to the work of others.
- They allow the participation of guest experts who can post information and respond to questions.

On the other hand, meeting course objectives and aligning course content are other purposes of discussion boards (Xia et al., 2013). Well-designed activities with the discussion board can get used to encourage the following:

- Demonstrate knowledge of main concepts: Students can use the discussion board to discuss key concepts, enabling them to share ideas as well as learn within the group. When students submit assignments directly to the teacher, no idea sharing takes place (Balaji & Chakrabarti, 2010).
- Community building: One of the main reasons for using discussion boards is building a community of learners. This application helps the student in becoming a part of a vibrant learning community, rather than being an independent learner who completes and submits assignments without any peer interaction (Harris &Sandor, 2007).
- Reflection: Reflective activities require the students to share their learning experience, or to describe how an experience or situation has personal value. Such activities require the teacher to allow open and honest responses.
- Building consensus: Activities on consensus building require the students to work together to create a product or come to agreement on a certain topic (Cheng et al.,2011).
- Critical thinking: Using the questioning techniques of higher order and other activities, students can gain critical thinking skills through the use of the discussion board.
- Student leadership: When effectively used, discussion forums can help in encouraging student leadership, giving them more voice in the class (Dringus & Ellis, 2005).

Most experts on online learning and student centered classrooms say that discussion boards can enable important learning procedures. However, the facilitators and teachers have to look for ways to support the students, driving them towards the learning.

In one hand, online educators using the discussion board have estimated their interaction with students to be three times greater than face-to-face interaction; the same applies for student's interaction with their peers. The learning and collaborative thinking is much higher (Dixson et al., 2006). On the other hand, instructors who

facilitate a large discussion board, the activity's fervor could even be overwhelming experience. There are challenges like making the most of this new learning experience format and getting students to participate frequently and thoughtfully.

In managing online discussion, an important requirement is in striking a balance in the interaction with students to make certain that the focus of the board is on learning. It has to be interesting enough that learners are pulled into conversation, but of course, it is important to keep in mind that the discussion should not be so complicated and dense that learners get overwhelmed. It is important to manage participants' interaction time and ensure that board interactions are relevant and enriching (Biggs, 2012).

ONLINE COURSES

Lock (2001) asserts that there is continuous growth in online courses in higher academics. Student interaction remains an important factor affecting students' learning experiences with online learning. The depth and nature of student interactions in the online environment differs greatly from face-to-face classes. While in physical classrooms, students can interact physically inside or outside the class; in the case of online courses, students may merely communicate with classmates via computer-mediated communication (CMC) like chat rooms, discussion boards, or emails. Dringus and Ellis (2005) argued that asynchronous technology might allow participants to compare their progress with others, reflect more deeply, and explore topics. However, there is an absolute requirement for other students to share responses to reach the potential of online communication. Song and McNary (2011) seconded the argument of Wozniak and Silveira, (2004): the high level of interdependence in online education requires navigating displacements in space and time, making the task of maintaining online interaction quite challenging.

Understanding students' online interaction is of utmost importance. Interaction ultimately determines the quality of online learning. Shattuck (2014) reviewed some trends in distance education and found that students generally judge distance education's quality on the basis of perceptions regarding interaction. Moreover, interactions between students in online classes can increase motivation and commitment to learning.

MOODLE LEARNING MANAGEMENT SYSTEM

Moodle Learning Management System allows ongoing communication within a defined community of learners in an online course through a discussion board (DB). Unlike email, the DB supports threaded messages organized by topics. Through the DB, a user can commence a new topic, look for a given topic, share attachments and web links, and view, post and edit replies. Within a discussion, messages can be viewed in either chronological or threaded sequence. The discussion board application in Moodle Learning Management System may be viewed as an electronic portfolio belonging to a group of individuals (a defined learning group). This medium is capable of recording and supporting a variety of communications, including attachments and web links. Using the DB as a Web 2.0 technology, students in a course can be remotely and actively engaged in educational discussions facilitated and led by the instructor. Through the DB, students can share their work and request feedback from peers and the instructor. An added advantage of the DB environment is that commenting on one student's work may help several other students. In this way, the comment automatically becomes visible and shared with the whole class.

The purpose of online communication platforms like discussion boards is to provide a way for students to interact and discuss components of the course. Discussion groups allow students to participate actively and communicate with each other and faculty members. As such, they supplement content delivery; however, discussion not only supplements the content covered and delivered in courses, but it also enhances understanding of the ideas and issues discussed in conventional, blended, or fully online courses. According to researchers, a form of active learning, such as discussion boards, can help students practically apply the knowledge (theories, etc.) acquired in their courses. Through discussion boards, students have an opportunity to share their thoughts and learn from each other.

The present study investigates the impact of discussion boards on grades as well as student satisfaction in using Web 2.0 technologies. It shows how the use of Web 2.0 technologies has been useful for students in online learning. In particular, this study seeks to elucidate on the immense usefulness of one interactive medium, the discussion board. This tool has enabled better student learning, allowing students to actually discuss the issues that crop up during a study.

THE STUDY CONTEXT AND DESIGN

To achieve our objectives, an experiment has been conducted at a private university located in Riyadh. The subjects are students in two sections of the same course, a three credit hour course in the faculty of Business Administration. Students had to interact through Moodle learning management system during the semester.

PARTICIPANTS AND SAMPLING

Sampling involves selecting a small subset of a population that is representative of the whole population for a research study (Fowler, 2002). However, to obtain valid and reliable results for a study, it is critical to maintain the involvement of the appropriate participants. Moreover, students in both groups should have the same average scores/grades so that we can ensure that the increase/decrease in grades was because of the use of discussion boards. For this study, a total of sixty students were targeted (thirty students in each group).

The sampling process is comprised of several stages. The first stage is to define the population of concern. For the purpose of this study, this population is university students. Next, a sampling frame should be specified to provide a set of items or events that are possible to measure. In this case, the sampling frame is comprised of students within the two sections of the selected course. Students will be selected initially based on their grades so that both sections have the same average performance. The sampling methodology chosen for this study is one in which every element in the population is given the same probability of selection; this is known as an "equal probability of selection" (EPS) design. As there are two sections, there is an added focus on the equality between these sections.

SURVEY ADMINISTRATION

Surveys are considered an important research technique. There are many different methods for conducting surveys. Given the nature of the subject being studied and the sample population, the best way to conduct the survey for this phase of this research study is to develop an online survey. This method also offers a low cost for data collection, potential high speed return, and the ability to consistently present a series of similar questions (Fowler, 2002).

The instructor motivated all students to participate to ensure a high response rate. Following the objectives of this study, the questionnaire was divided into two main parts: general information and demographics and students' satisfaction. The students' grades were obtained from the professor after the students granted their permission. The respondents have been asked to rate the measures using a 5-point Likert scale (1-Not at all; to 5-Greatly), this approach is commonly employed in online education research (Roberts et al., 2005). Table 1 shows survey items which had been used on this study.

Table 1: Survey Items

Construct	Measurement Items
Part I	
Age	18-20
	21-23
	24-26
	More than 26
Major	Finance
	Marketing
	Accounting
	Human Resource
Experience with Internet	Home only
	University only
	Internet cafes
	Wireless
	All of the above
The rate of Internet use per day (in hours)	Less than 1 hour
	1-3 hour(s)
	3-6 hours
	6-10 hours
	More than 10 hours
Marital Status	Married
	Single
	Divorced

		Widowed
GPA		Acceptable
		Good
		Very Good
		Excellent
The use of Moodle		Course Material
		Course Announcements
		Grade Center
		Discussion Boards
		All Mentioned
		None Mentioned
Performance Expectations		Acceptable
		Good
		Very Good
		Excellent
Social Influence		I don't share my ideas and no one is influenced by them
		I share my ideas but no one is influenced by them
		I share my ideas and some are influenced by them
		Colleagues are always influenced by my ideas
Part II		
	ID	
Satisfaction	SAT1	The student's recommendation of this course to others
	SAT2	The perceived satisfaction of the learning experience
	SAT3	How satisfied are you with the online content?
	SAT4	Level of online interaction with the instructor.
	SAT5	Ability of instructor to engage you on using e-learning.
	SAT6	Level of online interaction with other students.
	SAT7	Availability of other sources of information.
Part III		
Reflections	ID	
	Grades	The grade of the student in the exam
	No. of Clicks	The amount of time the learner spends studying online

In addition, other data was gathered from the Moodle reporting system. For example, students' behavioral data was gathered, including the use of different features and technologies on Moodle as well as their access times.

EXPERINATAL DESIGN

The experiment was conducted using two groups of university students (n = 30/group), studying the same course with the same instructor and using the same materials and systems. The average grades of the students selected from both groups were also equal. The difference was that one of the groups used the discussion board on Moodle, and the other group did not. The experiment took two months, and students were given the same exam at the same time. Additionally, they filled in a questionnaire (listed in the Appendix) after the exam, which asked about the satisfaction of the educational process and gathered other important information.

In this study, the independent variable is the use of the Moodle discussion board on the learning management system by students studying in a blended learning environment. The use of this tool was available to one section, while the other section used the learning management system without the discussion board tool. The dependent variables are the students' satisfaction and the students' performance. Students' satisfaction was measured through the questionnaire submitted to them after a month of using the e-learning system. Student performance was measured by considering the grades of students in the exam given after one month of use. The access data of each student was taken from the online system and converted linearly to a 1–5 scale.

ANALYSIS AND RESULTS

In this study, the collected data had been analyzed to obtain descriptive statistics and an independent sample *t*-test procedure was used for the statistical comparison of the cohort's survey scores and grades. The analyzed data are presented as follow:

DESCRIPTIVE STATISTICS

Age: The course had participants spread widely over the 18–26 age groups, with four participants over age 26.

The majority (29 students) belonged to the 18–20 age group, while 18 students belonged to the 21-23 age group. The enrolled students are evenly distributed between the cohorts. Marital Status: All of the participants (60) were single in the two cohorts. **Attitudinal Attributes:** The students were asked how they would rate their social influence on the peer group; their responses are illustrated in the following graph. There was not much drift between populations, but the students in the group with access to the discussion board had slightly higher ratings.

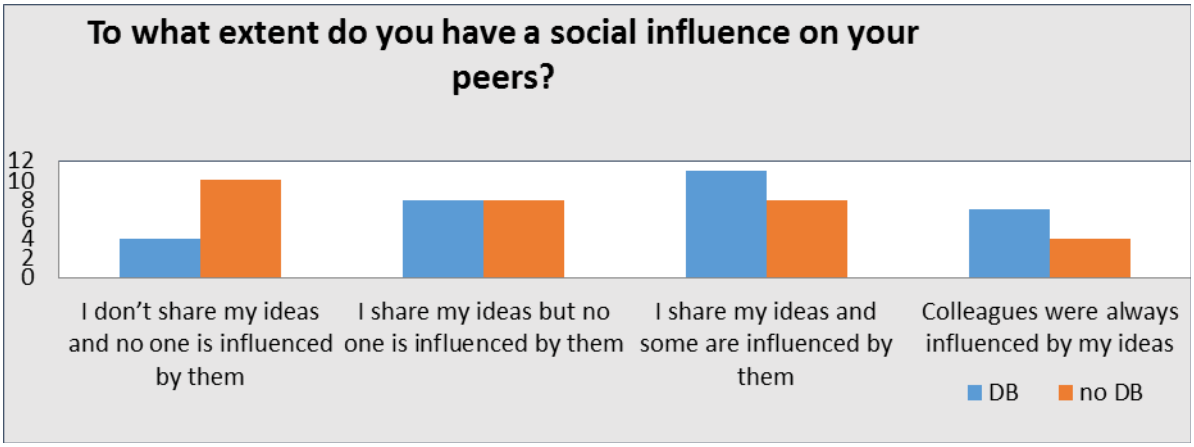
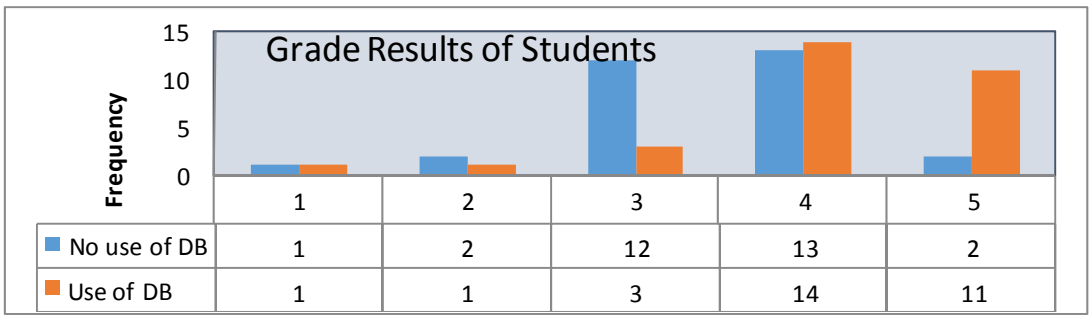


Figure 1: Attitudinal attributes

Academic Background: Students enrolled in the course were evenly distributed between the two cohorts by academic background. **Past Academic Performance:** Participants in both cohorts were evenly distributed with regard to past academic performance, which was identified as either "acceptable," "good," "very good," or "excellent grades". **Internet Access and Usage**: Participants were evenly spread between the two cohorts with various means of Internet access and usage, which varied from 1–3 hours per day to more than 10 hours per day. The majority of students access the Internet from their mobile phones. Percentages for other methods of access vary, but many students' responses are distributed among all options. Only a few students access the Internet from within the university.

The purpose of the first research question was to gather evidence to document the effectiveness of online discussion boards (a type of Web 2.0 technology) on student achievement. Student grades from the unit exam for the online course were collected to investigate the following hypothesis: "The use of online discussion boards (a type of Web 2.0 technology) in Moodle will enhance student performance."
Impact on Students' Grades and Satisfaction

Figure 2 represents the distribution of students' Likert scores of 1–5, separated by cohort. As can be seen below, 25 out of 30 students who used the discussion boards received either a 4 or 5 average grades, compared to only 15 out of 30 students who did not use discussion boards and received a 4 or 5 average grade. Twelve out of 30 students without access to discussion boards had an average grade of 3, compared to 3 out of 30 students who used discussion boards.



	1	2	3	4	5
No use of DB	1	2	12	13	2
Use of DB	1	1	3	14	11

Figure 2: Grade Results of Students

Table 2 below presents the means and standard deviations of the Likert scores of the exam grades across the two groups, with and without the use of discussion boards (DB). A t-test analysis was performed to compare the difference in mean between the two groups. The group with access to DBs scored significantly higher on the test than the group without access to DBs (t value = -2.84, p = .0063) as shown at **Table 3**.

The TTEST Procedure

Variable: PER1

Table 2: the means and standard deviations of the Likert scores of the exam grades

Group	Method	Mean	95% CI Mean		Std Dev	95% CI Std Dev	
No use of DB		3.4333	3.1128	3.7539	0.8584	0.6836	1.1539
Use of DB		4.1	3.7417	4.4583	0.9595	0.7642	1.2899
Diff (1-2)	Pooled	-0.6667	-1.1372	-0.1962	0.9103	0.7706	1.1124
Diff (1-2)	Satterthwaite	-0.6667	-1.1373	-0.196			

Table 3: Applying t-test for student grades

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	58	-2.84	0.0063
Satterthwaite	Unequal	57.295	-2.84	0.0063

The students who had access to discussion boards were more confident about their performances. **Figure 3** depicts the distribution of students' expectations of their performance on the test. A greater percentage of the students who were provided access to the discussion boards rated their expectations as either "Very Good" or "Excellent."

Figure 3: Expected Performance In the test

STUDENTS' ATTITUDE TOWARDS THE LEARNING ENVIRONMENT

To obtain more in-depth information on the students' attitudes and levels of satisfaction towards this online course, seven assessment benchmarks were included in the survey conducted at the end of the unit test for the course. Each benchmark was rated using a 5-point Likert scale. Satisfaction was assessed using the following benchmarks:

SAT1: I would recommend this course to others.
SAT2: I am satisfied with the learning experience.
SAT3: I am satisfied with the online content.
SAT4: Level of online interaction with the instructor.
SAT5: Ability of instructor to engage you on using e-learning.
SAT6: Level of online interaction with other students.
SAT7: Availability of other sources of information.

Table 4 illustrates satisfaction scores of each of the above metrics. The means of the Likert scores are compared between the groups with and without access to discussion boards.

		1	2	3	4	5
SAT1: I would recommend this course to others.	No use of DB	0	3	17	10	0
	use of DB	0	0	2	12	16
SAT2: I am satisfied with the learning experience.	No use of DB	0	5	20	5	0
	use of DB	0	0	4	12	14
SAT3: I am satisfied with the online content.	No use of DB	0	6	19	5	0
	use of DB	0	2	15	13	0
SAT4: Level of online interaction with the instructor	No use of DB	7	12	11	0	0
	use of DB	0	0	8	20	2
SAT5: Ability of instructor to engage you on using e-learning	No use of DB	0	12	18	0	0
	use of DB	0	0	7	19	5
SAT6: Level of online interaction with other students.	No use of DB	5	19	6	0	0
	use of DB	0	0	2	12	16
SAT7: Availability of other sources of information	No use of DB	0	11	19	0	0
	use of DB	0	0	10	20	0

SAT1: I WOULD RECOMMEND THIS COURSE TO OTHERS

This benchmark assesses students' overall satisfaction with the online course in which they were enrolled. This besides the content and benefit of course to the student, is expected to influence and be influenced by all components of the online course surveyed in online questions and also the student's expectation of their performance on the course.

Table 4 illustrates the distribution of students in the two cohorts by their satisfaction scores of 1–5. As can be seen below, 28 out of 30 students who used the discussion boards gave either a 4 or 5 satisfaction rating, compared to 20 out of 30 students who did not use the discussion boards and who gave either an average or below average satisfaction rating. A t-test procedure statistically validates the significant differences between the satisfaction scores of the two groups (*t* value = -7.61, p = <.0001).

SAT2: I AM SATISFIED WITH THE LEARNING EXPERIENCE

This benchmark is an extension of the first benchmark and is aimed at understanding the perception and satisfaction of students with the content, layout, and experience with the online course. This is aimed at identifying the usefulness and perceived benefit of the course to a student.

Table 4 illustrates the distribution of students in the two cohorts by their satisfaction scores of 1–5. As can be seen below, 26 out of 30 students who used the discussion boards gave either a 4 or 5 learning experience satisfaction rating, compared to 25 out of 30 students who did not use the discussion boards and who gave either an average or below average learning experience satisfaction rating. A *t*-test procedure statistically validates the significant differences between the satisfaction scores of the two groups; t value = -7.92, p = <.0001.

SAT3: I AM SATISFIED WITH THE ONLINE CONTENT

Ideally, the inclusion or exclusion of discussion boards in the online course would not influence this benchmark. This is intended, rather, to obtain student feedback regarding their overall satisfaction with the online content presented in the course. According to the graph in Figure 6, DBs also help transcend the limitations of the content presented in online courses, and, thus, improve the overall experience.

Table 4 illustrates the distribution of student under two cohorts by their online content satisfaction scores of 1–5. As can be seen below, 15 out of 30 students who used the DBs gave a 3 online content satisfaction rating, which is very comparable to the average rating of the 19 out of 30 students who did not use the DBs. However, a 4 online content satisfaction rating (which implies a greater satisfaction with the online content) was given by 13 students who used the DBs compared to only 5 students who did not use the DBs. A *t*-test procedure statistically validates the significant differences in the satisfaction scores of the two groups (*t* value = -2.52, p = 0.0145).

SAT4: LEVEL OF ONLINE INTERACTION WITH THE INSTRUCTOR

The responses to this benchmark are expected to be influenced by students' use of DBs. As can be seen below, all the students who did not use the DBs gave either an average or below average rating for online interaction with their instructor. However, 22 out of 30 students who used the DBs rated this experience with a 4 or 5 rating. The differences in the mean scores of the two cohorts for this benchmark are evident and statistically validated by *t*-test result; *t* value = -9.59, p = <.0001s. The average satisfaction results for the 8 students who used the DBs indicate an opportunity for instructors to find more effective methods to promote meaningful discussions with and between students.

SAT5: ABILITY OF INSTRUCTOR TO ENGAGE YOU ON USING E-LEARNING

As with the fourth benchmark, this benchmark is also impacted by students' ability to access the discussion boards. The students who did not use the DBs rated this experience as average or below average. Among the student who did use the DBs, 7 students rated this experience as average. The *t*-test results validate the evident differences between the mean scores for this benchmark; *t*-value = -9.06, p = <.0001. The average satisfaction score for the 7 students with access to the DBs calls for an investigation into the methods instructors can use to manage and effectively engage all students in active e-learning.

SAT6: LEVEL OF ONLINE INTERACTION WITH OTHER STUDENTS

The students who did not use the DBs had little or no means to interact online with other students other than the discussions held during online class sessions and, thus, rated their level of online interaction with other students as average or below average. Students who had access to the DBs were more easily able to interact with other students, and, thus, only two students rated their level of online interaction with other students as average. The result of *t*-test of this item is *t* value = -15.15, p = <.0001.

SAT7: AVAILABILITY OF OTHER SOURCES OF INFORMATION

This benchmark hints at assessing students' experiences with regard to their ease of access to different sources of information outside the content available in the course. As with the last benchmark, SAT7 would be more relevant for students who had access to the DBs, as these students were able to share information online through different discussion board threads and by reviewing different discussions.

As can be seen below, the students with access to DBs gave fairly high scores for this benchmark. On the other hand, ten students with access to DBs rated this experience as only average; however, this could be a result of ineffective means of organizing and running discussion threads, which may impact students' ability to access required information. The result of *t*-test is *t* value = -8.25, p = <.0001

Supporting the first hypothesis of this study, students granted access to discussion boards showed a higher level of performance than students who did not have access. The use of discussion boards are believed to provide

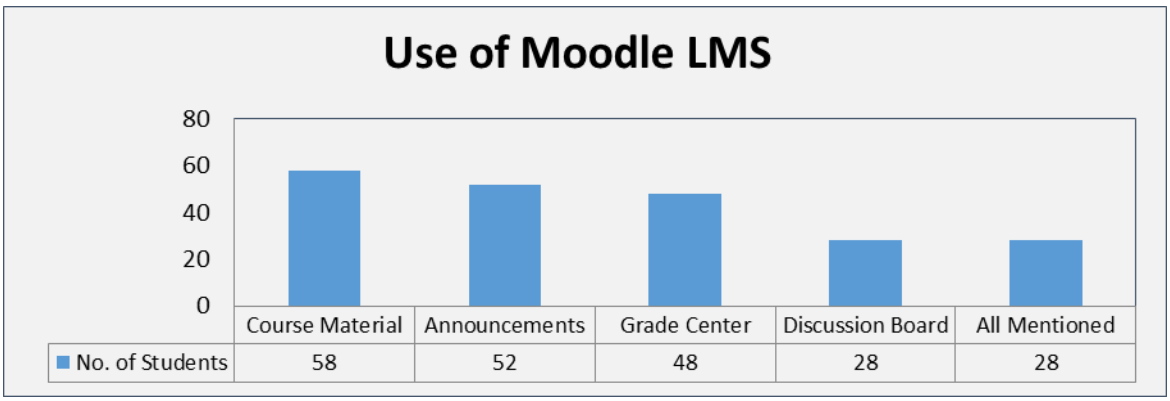


Figure 4: Use of the Moodle LMS by the two groups

many benefits. Moreover, the engagement of students within the Moodle and the consequent impact of the above-mentioned factors was also noted in students' responses to the survey, which allows us to understand the extent that LMS was used by students. The graph below indicates that the students with access to DBs other than discussion boards were also active and participative with these other tools of the system.

With regard to the second research question of the study, several themes became evident after students' survey responses regarding their overall satisfaction with the online course were studied. Students who participated in discussion boards were largely positive about the experience. Several of reflections from the survey indicate that discussion boards are effective learning tools that promote overall student satisfaction with the online experience and content of the course. It is evident from these results that the students in the experimental cohort felt the interaction and collaborative experience to be a positive one that helped increase their knowledge and understanding of the course material.

The following correlation table indicates a strong association between academic performance and overall satisfaction of the students with the online course. As validated in the study, online discussion boards are effective in influencing the performance of the enrolled students, due to several factors. Students with access to these discussion boards are also able to break the boundaries of space and time and interact freely with their peers and instructor; for example, they can make the best of their course by sharing information outside of the course's online content and by sharing and clearing any doubts to become more comfortable with and confident about their experience in the course. Confidence in academic performance and ease of interaction helps to explain why students who have access to discussion boards have elevated survey scores in comparison to those students without discussion board access, who, on average, struggle with the online content and the limited access to their instructor and peer assistance. Additionally, as indicated in the individual survey results, overall satisfaction scores (SAT1) are minimally associated with online content satisfaction scores (SAT3), while grades and overall satisfaction have a fairly strongly association with other measures.

It is important and interesting to consider the impact of the students' level of engagement with the LMS on the students' performance of engagement. The level of engagement is determined by the scores associated with the number of clicks students made while navigating the learning management system. As can be seen in the figure below, students enrolled in the course with access to the discussion boards had a higher score in terms of usage (or in other terms of engagement) with the LMS. The correlation table below depicts a significant association between the scores for number of clicks, grades, and satisfaction scores.

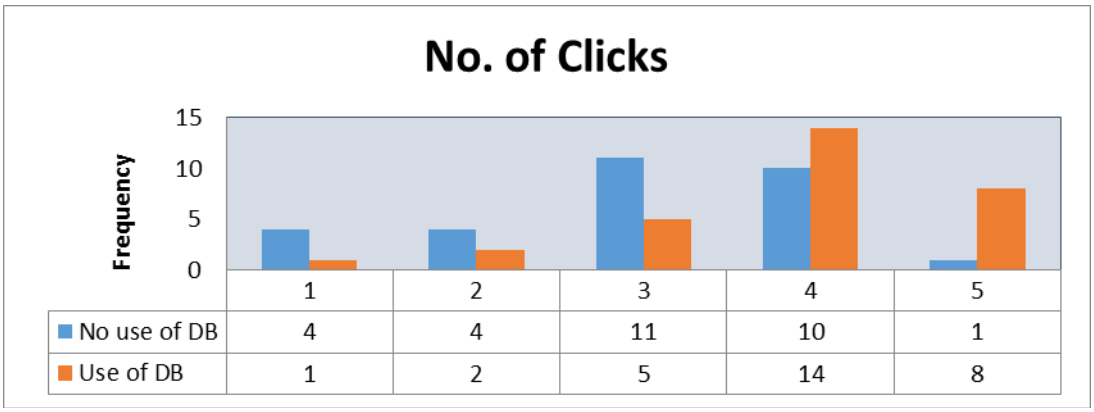


Figure 5: Number of clicks in the Moodle LMS by the two groups

Table 5: Applying Correlation coefficients between Grades and No. of clicks

Pearson Correlation Coefficients, N = 60 Prob > |r| under H0: Rho = 0	
	No. of Clicks
Grades	0.39193
	0.0020
SAT1	0.63176
	<.0001
SAT2	0.46283
	0.0002
SAT3	0.08598

	0.5136
SAT4	0.36303
	0.0044
SAT5	0.34299
	0.0073
SAT6	0.43320
	0.0005
SAT7	0.38451
	0.0024

CONCLUSIONS

Discussion boards are considered to be a powerful tool for the inclusion and development of pedagogical competencies, such as acute thinking, collaboration, and reflection. Because of their professed benefits, discussion boards should become progressively more utilized in online education. Discussion boards offer great pedagogical leverage, for example, by promoting reflection, analysis, and higher-order thinking. It is among one of the most effective tools for collaborative learning and can enrich students' learning experiences in several ways. A well-designed and executed online discussion board can encourage students' activity, collaboration, motivation, and other social constructivist attributes of the learning process. In this study, we analyzed and assessed the impact of discussion boards on student learning and satisfaction. We feel that this assessment will help increase online course developers' ability to design more effective learning experiences to enhance student performance, learning, and satisfaction. It will also encourage researchers to explore the various features and applications of discussion boards. According to our research, involvement in discussion boards can boost student performance and satisfaction. In some instances, more reflection and thought with regard to a particular agenda during the discussion portion of a course can produce better perceptive outcomes.

It should be noted, however, that online discussions, or more specifically, reading through threaded discussions, can be time consuming, and students are often discouraged when there are too many posts to read, particularly when posts are lengthy. After a close examination of such instances, discussion boards could be portrayed as being both effective and ineffective. For example, while some students in the online class may have felt better connected to other students by interacting via the discussion boards, other students may have felt that discussions moved too quickly and may have subsequently begun to feel more disconnected from other students. However, the disengaged students' feelings may have less to do with the discussion boards themselves and more to do with how the discussion boards were run. Just as participation in discussion boards can impact students' sense of community and connectedness, instructional uses of the discussion boards also affect the senses of either collaboration or alienation that students experience in online courses.

Keeping in mind the perceived benefits, there are potential challenges posed with the use—or more precisely, the inappropriate use—of discussion boards. For example:

1. A very common notion among users of discussion boards is the large amount of time that it takes to educate students to use them, especially when students are required to post several times within a discussion forum. Even though the instructor's presence may not be as apparent (as it is advised for instructors not to post too much within a discussion), instructors still have to address every post; when instructors do respond to a post, it is very important that their comments are thoughtfully worded so as not to stifle or shut down discussion, and thoughtful posts do take some time to develop. It is unfortunate but significant that almost all instructors who have been teaching online and using discussion forums as a major element of their courses report feeling worn out by the process. These same instructors, however, also acknowledge how valuable these discussions are to the quality and extent of student learning. Thus, they must balance the amount of work and time they invest in the discussion boards with ensuring the best quality of learning experience for their students.
2. Some instructors reported that using a blended class format in which students meet face-to-face once a month or even more frequently can undermine the quality and depth of online discussions, because some students tend to withhold sharing their thoughts and engaging effectively in online discussions, preferring to wait to share their ideas in person during the face-to-face class setting. Furthermore, sometimes by the time a class meets face-to-face, students' responses to an online discussion may no longer be relevant, especially if more than a week has gone by.
3. Student participation in online discussions may not be deliberate and proactive. Effective participation and indulgence requires forethought from the instructor and an ongoing engagement from the instructor and students to engage in the material. With regard to the instructor's role in the process, the nature and depth of discussion exercises should be determined in the preliminary design phase of an online course.

The implementation of an instructor's vision is very important and must be actively and attentively promoted for the phase of the course. Nonetheless, despite thought and oversight, discussion threads often lack depth, include repetitive comments, and involve minimal interaction. Therefore, many online instructors find it judicious to include measures that promote open discussion with rich and self-initiated dialogue, as opposed to an environment of obligatory discourse, hasty postings, and repetitive content. While the utilization of lively and timely subject matter in online discussion boards can be an effective way to promote and maintain students' attention throughout the course of an exercise, many students may procrastinate in getting involved in discussions and may discontinue completely once they have made their individual obligatory posts. Simply obligating students to post comments does not result in higher-order thinking, meaningful content, or continued interaction without the incorporation of reflection, blend, and application in the student posting process.

Given the above potential challenges, more research and experimentation should be done on these topics. If professors are going to continue to use online discussions boards in online courses, it is important that they be provided with knowledge about the effective use of these tools and their potential impact on students. Further examination of this topic could potentially lead to greater student satisfaction and achievement.

REFERENCES

Abulibdeh, E. & Syed Hassan, S. (2011*). E-learning interactions, information technology: Self-efficacy and student achievement at the University of Sharjah, UAE*. Australasian Journal of Educational Technology, 27(6), 1014-1025.

Al-Oqily, I., Alkhatib, G., Al-Khasawneh, A. & Alian, M. (2013). *Social networks impact: The case of Jordanian youth. International Journal of Continuing Engineering Education and Lifelong Learning,* 23(1), 100-114.

Balaji, M. & Chakrabarti, D. (2010). *Student interactions in online discussion forum: Empirical research from media richness theory perspective*. Journal of Interactive Online Learning, 9(1), 1-22.

Bennett, S., Bishop, A., Dalgarno, B., Waycott, J. & Kennedy, G. (2012). *Implementing Web 2.0 technologies in higher education: A collective case study*. Computers & Education, 59(2),524-534.

Biggs, J. (2012). *What the student does: Teaching for enhanced learning*. Higher Education Research & Development, 31(1), 39-55.

Blackmon, S. (2012). *Outcomes of chat and discussion board use in online learning: A research synthesis*. Journal of Educators Online, 9(2), 2.

Blackwell, C., Lauricella, A. & Wartella, E. (2014). *Factors influencing digital technology use in early childhood education.* Computers & Education, 77, 82-90.

Chen, Y., Hwang, R. & Wang, C. (2012). *Development and evaluation of a Web 2.0 annotation system as a learning tool in an e-learning environment*. Computers & Education, 58(4), 1094-1105.

Cheng, C., Par'e, D., Collimore, L. & Joordens, S. (2011). *Assessing the effectiveness of a voluntary online discussion forum on improving students in course performance.* Computers & Education, 56(1), 253-261.

Comeaux, P. & McKenna-Byington, E. (2003*). Computer-mediated communication in online and conventional classroom: Some implications for instructional design and professional development programmes*. Innovations in Education and Teaching International, 40(4), 348-355.

Dixson, M., Kuhlhorst, M. & Reiff, A. (2006). *Creating effective online discussions: Optimal instructor and student roles.* Journal of Asynchronous Learning Networks, 10(1), 3-5.

Dringus, L. & Ellis, T. (2005). *Using data mining as a strategy for assessing asynchronous discussion forums.* Computers & Education, 45(1), 141-160.

Fowler, F. (2002). *Survey Research Methods*. 3rd edition. Applied Social Research Methods Series, Volume 1.

Garrison, D.R., & Anderson, T. (2003). *e-learning in the 21st century: A framework for research and practice*. New York, Routledge.

Harris, A. & Rea, A. (2009). *Web 2.0 and virtual world technologies: A growing impact on IS education*. Journal of Information Systems Education, 20(2), 137.

Harris, N. & Sandor, M. (2007). *Developing online discussion forums as student centred peer e-learning environments. In: ICT: Providing Choices for Learners and Learning*. Proceedings Ascilite Singapore 2007, pp. 383-387.

Kietzmann, J., Hermkens, K., McCarthy, I. & Silvestre, B. (2011). *Social media? Get serious! Understanding the functional building blocks of social media.* Business Horizons, 54(3), 241-251.

Kurbalija, J., Dincic, D. & Slavik, H. (2004). *Interactive hypertext in e-learning: A case study asynchronous learning in the online classroom*. Proceedings of the Fifth International Conference on Information Technology Based Higher Education and Training.

Lock, J. (2001*). Review essay: Lessons from the cyberspace classroom: The realities of online teaching by Palloff and Pratt*. IEJLL: International Electronic Journal for Leadership in Learning, 5(14), 5.

Mangold, W. & Faulds, D. (2009). *Social media: The new hybrid element of the promotion mix.* Business Horizons, 52(4), 357-365.

McNary, S. & Song, L. (2010). *Understanding students. Collaborative online interaction: Analysis of discussion board postings*, 1, 716-721.

Roberts, T. G., Irani, T. A., Telg, W., & Lundy, L. K. (2005). *The development of an instrument to evaluate distance education courses using student attitudes*. The American Journal of Distance Education 19(1), 51–64.

Shattuck, K. (2014). A*ssuring quality in online education: Practices and processes at the teaching, resource, and program levels*. 318 pp. Stylus Publishing.

Song, L. & McNary, S. (2011). *Understanding students' online interaction: Analysis of discussion board postings*. Journal of Interactive Online Learning, 10(1), 1-14. http://www.ncolr.org/jiol/issues/pdf/10.1.1.pdf

Wozniak, H. & Silveira, S. (2004). *Online discussions: Promoting effective student to student interaction*, Proceedings of the 21st ASCILITE Conference (pp. *956-960*)

Xia, C., Fielder, J. and Siragusa, L. (2013). *Achieving better peer interaction in online discussion forums: A reflective practitioner case study.* Issues in Educational Research, 23(1), 97-113.

Zhong, S. (2013). Proceedings of the 2012 international conference on cybernetics and informatics. (1st ed.). New York, NY: Springer.

Zhu, C. (2012). *Student satisfaction, performance, and knowledge construction in online collaborative learning*. Journal of Educational Technology & Society, 15(1), 127-136.