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Mobile Learning: Malaysian Initiatives & Research Findings

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Foreword

Minister of Higher Education
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Assalamualaikum wbt, Greetings to all and Salam 1Malaysia

I thank Allah S.W.T, for with His blessings, I am given the opportunity to write a few welcoming remarks in this edition entitled 'Mobile Learning: Malaysian Initiatives and Research Findings'.

This book consists of significant research works on mobile learning carried out by a number of researchers from various higher learning institutions in Malaysia. As the concept of mobile learning has come into existence in the teaching and learning scenario in Malaysia, I am confident that this book would contribute to the success of the implementation of one of the 21 Critical Agenda Projects (CAP), that is e-Learning and the National Key Result Areas (NKRA) of the Ministry of Higher Education (MOHE).

I would also like to take this opportunity to congratulate Professor Dr. Mohamed Amin Embi, Chairman, Council of the Malaysian Public HEIs e-Learning Coordinators (MEIPTA), who is also the founding President of the Mobile Learning Association of Malaysia for his initiative in compiling the latest research initiatives and findings related to Mobile Learning and publishing them in this edition.

With the same time, I wish to express my appreciation to all the researchers who have shared their research findings on Mobile Learning in this compilation. Indeed, the findings are very significant to MOHE in order to formulate related policies and to introduce alternative and latest teaching and learning delivery strategies and techniques in line with rapid development of Information and Communication Technologies (ICT).

As regard to this, all higher learning institutions in Malaysia must be more rigorous in creating dynamic and innovative e-Learning environments that enhance meaningful learning amongst students.

Wassalam.

DATO' SERI MOHAMED KHALED BIN NORDIN

Foreword

Secretary General
Ministry of Higher Education Malaysia

Assalamualaikum wbt and Greetings to all

The 21st century is believed to be an era of digital natives and digital immigrants; hence, there is a strong growth in the use of technological innovations in daily life, including mobile technology.

The various research studies on Mobile Learning presented in this edition are additional initiatives towards enhancing the National e-Learning Policy which was officially launched by the Minister of Higher Education Malaysia in 2012. This is in line with the vision and mission of the Critical Agenda Projects (CAP) and the National Key Result Areas (NKRA) of the Ministry of Higher Education.

The contents of this book highlight the innovative trends and challenges of implementing Mobile Learning especially in the context of higher education in Malaysia. The findings of these research initiatives are compiled into 13 chapters, covering several significant aspects of Mobile Learning.

I would like to extend my sincere thanks to all the researchers who were involved in sharing their research findings on Mobile Learning in this compilation. I would also like to congratulate MEIPTA for taking this leading role in making the publication of this edition a success. Such contribution is greatly appreciated and should be continued to further enhance the spirit of knowledge sharing and dissemination among Malaysian HEIs.

Wassalam.

DATUK AB. RAHIM BIN MD. NOOR

Foreword

Director General
Department of Higher Education
Ministry of Higher Education Malaysia

Assalamualaikum wbt and Greetings to all

The publication of this edition, 'Mobile Learning: Malaysian Initiatives and Research Findings' is very timely and in line with the aspiration of the Ministry of Higher Education (MOHE) to further strengthen the move in creating alternative and dynamic instructional approaches, strategies, and techniques.

As a brand new trend emerging from e-learning, Mobile Learning technology is seen as a dynamic tool in facilitating the teaching, learning and research efforts among the lecturers and their students.

The Council of the Malaysian Public HEIs e-Learning Coordinators (MEIPTA) which has been established since 2007 plays a key role in assisting MOHE in ensuring the success of the implementation of e-Learning in all Malaysian higher education institutions. Hence, MEIPTA's effort in documenting significant research initiatives and outcomes on Mobile Learning in this edition is very much appreciated.

MOHE, through the Higher Education Leadership Academy (AKEPT), will continue to provide support to train HEIs instructors with the latest delivery techniques including Mobile Learning in an effort to acculturate e-Learning more rapidly among all lecturers.

On behalf of MOHE, I would like to express my deepest gratitude to all the researchers who have undertaken considerable research endeavours on Mobile Learning. I hope, such efforts can be continued from time to time to improve the quality of teaching and learning in Malaysian higher education institutions.

Wassalam.

PROF. DATO' DR. RUJHAN BIN MUSTAFA

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{ Chapter One }

Overview of Mobile Learning

Mohamed Amin Embi & Ebrahim Panah
Universiti Kebangsaan Malaysia

Introduction

In the last one hundred years, education has undergone gradual changes and evolved from being exclusively appreciated by the elite to being accessible to the public. Likewise, the learning approach has also evolved from learning merely in the classroom to distance learning and the virtual classroom. Technologies have also urged the process of delivering content to learners. A knowledge society is a learning society. Accordingly, a learning society has the responsibility of providing opportunities for its people to hunt for knowledge. With the advent of technology, knowledge acquisition is no longer limited to the classroom. Hence, indirectly, technology can help promote lifelong learning (Norazah Mohd Nordin, Mohamed Amin Embi, & Melor Md. Yunus, 2010). More recently, the application of technology in regard with learning has undergone a lot of changes. For example, it has transited from desktop to laptop, in turn from laptop to palmtop devices such as mobiles and tablets, and thereby the concept of Mobile Learning has come into existence. As the concept of Mobile Learning encompasses learning through every kind of portable palmtop devices including tablets, in this book, Mobile Learning is used as an umbrella term entailing learning through such devices.

Mobile Learning

Only half a century ago, communication via telephone provided the ability to communicate with someone in a remote place. Nevertheless, the capability and capacity of the telephone has expanded to encompass other characteristics as well. Today, mobile devices combine the features of traditional telephone, with other features such as text messaging, a diary, wireless internet connection, etc. Also, certain types of phones come with personal computer capabilities. In fact, with the advent of new and portable technology such as mobiles and tablets, technology-armed

learning has shifted from desktop-based learning to palmtop-based learning. Mobile phones increasingly enable people to access the Internet anywhere and anytime (Chen, 2010).

In terms of Mobile Learning, it is argued that there is a growing appreciation that learning is more and more happening on the move going beyond the limitation of educational environments (Ros i Solé, Calic & Neijmann, 2010). It is argued that as a result of Mobile Learning, students change from passive learners to active participants and voluntarily engage in the learning process. Furthermore, the use of Mobile Learning activities in class highlights the power of the Mobile Learning system as persuasive technologies, i.e., such technologies can be used to change people's thoughts, feelings and actions (Wang, Shen, Novak & Pan, 2009). With the advent of new and portable learning technologies and their associated applications, Mobile Learning is employed in various fields of studies including language learning. With the emergence of Mobile Assisted Language Learning (MALL), not only learners' engagement approach in language learning may become more portable, but also more informal and personal (Ros i Solé *et al.*, 2010). MALL has been taken up as a useful means of presenting language learning content and contributing collaborative language learning. Likewise, Godwin-Jones (2008) points out that with robust language support, mobile devices may open up new vistas for language learning. In particular, it would seem logical to leverage the current student generation's heavy reliance on social networking in support of language learning, with uses such as text messaging for language partners, language class linking through Facebook updates, or Twitter updates. However, the scope of Mobile Learning, in this book, is vast and in addition to language learning, it encompasses other subject areas as well.

Earlier research on the use of mobile phones in delivery of educational content was restricted to the features available on mobile phones. For instance, a study conducted in Africa showed the use of the short messages system in communicating with students across the continent. Likewise, a study in the USA showed that students positively reacted towards receiving text messages in the course (Kovalik & Hosler, 2010). A study in Japan showed that Japanese students prefer to use the email function on their mobile phone (Norazah Mohd Nordin *et al.*, 2010). Thanks to the rapid advancement of mobile technology, the concept of Mobile Learning is defined variously by different researches in the field accordingly.

Definition of Mobile Learning

Owing to the swift advancement and popularity of wireless communication and mobile technologies, Mobile Learning has become more and more important (Hwang & Tsai, 2011). Numerous research studies on the use of mobile and wireless communication technologies in education have been conducted, where these technology-supported learning approaches are recognized as Mobile Learning by the researchers (Hwang & Tsai, 2011; Shih, Chuang & Hwang, 2010). Mobile Learning has been defined differently by different researchers and organisations. A commonly accepted definition of Mobile Learning is using mobile technologies to facilitate and promote learning anywhere and at anytime' (Hwang & Tsai, 2011; Shih, Chu, Hwang, & Kinshuk, 2010). Ally (2009) defines Mobile Learning as the delivery of learning content to mobile devices. According to Kukulska-Hulme and Traxler (2005), "Mobile Learning is partly about learning and partly about the breakthroughs of mobile computing and global

marketing of mobile devices. It is rapidly becoming a credible and cost-effective component of online and distance learning and anyone developing courses in companies, universities and colleges must consider carefully what it has to offer" (p.2). Simply defining, Wexler *et al*. (2007) refer to Mobile Learning as "Any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediated through a compact digital portable device that the individual carries on a regular basis, has reliable connectivity, and fits in a pocket or purse" (p. 21).

Although these definitions have been provided from different aspects, they share the same idea, i.e., the mobile devices (such as personal digital assistants, cellular phones, and tablets) play an important role in the learning activities no matter whether the activities are conducted in the field or in the classroom (Hwang & Tsai, 2011; Vavoula, Sharples, Rudman, Meek & Lonsdale, 2009).

All in all, it appears that there is no watertight definition for Mobile Learning. However, all the definitions offered directly or indirectly have highlighted the idea that Mobile Learning champions the promotion of learning anywhere and anytime.

Research Trends in Mobile Learning

In a review study by Hwang and Tsai (2011), they examined the Mobile Learning papers published in the Social Science Citation Index (SSCI) database from 2001 to 2010. Six major technology-based learning journals (with high impact based on ISI), such as the British Journal of Educational Technology (BJET), Computers and Education (C&E), Educational Technology and Society (ETS), Educational Technology Research and Development (ETR&D), Journal of Computer Assisted Learning (JCAL) and Innovations in Education and Teaching International (IETI) were selected to analyse the research trends. Studies on Mobile Learning from the 3995 papers published by these journals from 2001 to 2010 were filtered. Only papers identified as being of the kind 'articles' in the SSCI were taken into consideration. After two iterations of filtering the papers and discussing the issue of appropriate selection, a total of 154 document items in relation to Mobile Learning were selected.

Following thorough discussion on subcategories for the research samples and learning domains, the finalised subcategories of the research samples were identified, i.e., 'elementary school', 'junior and senior high school', 'higher education', 'teachers', 'working adults' and 'non-specified'. Furthermore, the learning domains were classified into the following subcategories, including science (for example, physics, chemistry, & biology, medical and sport science), mathematics, language and art, social science, engineering (including computers), others and non-specified.

In terms of number of article published, the number of Mobile Learning articles published from 2001 to 2010 varied. They found that the research in this field grew at a fast pace from 2008. By dividing the past 10 years into two periods, they found that the number of papers published during the second 5 years (i.e., 122) was nearly four times that of the first 5 years (i.e., 32), implying that Mobile Learning research has greatly increased in the course of succeeding five years.

In regard with research sample groups, it was found that from 2001 to 2010, research samples in higher education were selected most (59), followed by elementary school students (41) and high school students (17). Only a few studies selected teachers (6) and working adults (6) as the research sample. By dividing the time period into the first and the second 5 years, they found that the sequence remains the same, implying that students from higher education and elementary schools have remained the major samples of Mobile Learning research. Furthermore, this indicates that it is worth paying more attention to investigations of teachers and working adults' Mobile Learning in the future.

In relation to research learning domains, it was found that most studies did not involve any learning domain, instead, they mainly focused on the investigation of motivations, perceptions and attitudes of students toward Mobile Learning in the two time periods (13 & 36) followed by 'engineering (including computers)' (2 & 20), 'language and art' (3 & 21) and 'science' (5 & 25). As the number of articles published in the second 5 years is nearly four times that of the first 5 years, it is interesting to see what learning domains have been selected more often in the same time periods. It is found that in comparison with the studies conducted in the first 5 years, studies focused on the learning domains of 'engineering (including computers)', 'arts and language', 'science' and 'social science' have significantly increased in the second 5 years by 10, 7, 5 and 4.5 times, respectively. On the other hand, the ratios for mathematics and other learning domains are relatively low; that is, 2 and 1.4, respectively.

Regarding the contributing countries in the area of Mobile Learning research, in the first 5 years, US authors contributed the most publications (7) followed by UK authors (5) and Taiwanese authors (4). However, Taiwan ranked number one over the second 5 years with an amazing number of publications (51) which is clearly related to the initiation of the Mobile Learning project (Hwang & Tsai, 2011). Moreover, it is worth noticing that more countries have embarked studies in this vein and contributed to the Mobile Learning studies in the past 5 years, for instance, Singapore, Italy and Ireland.

However, although Hwang and Tsai's (2011) study cannot represent all the studies conducted on Mobile Learning with different trends, this study approximately covers the dominant researches undertaken in this vein within a decade (from 2001 to 2010) indicating the future of research in this area.

Mobile Learning & Theories of Learning

It is widely accepted that Mobile Learning is championed by different theories of learning namely, behaviourist, constructivist, situated, collaborative, and informal lifelong learning (Naismith *et al.*, 2006). In terms of Mobile Learning application**,** as Table 1.1 illustrates, some learning theories such as behaviourist learning, constructivist learning, situated learning, collaborative learning, and informal lifelong learning advocate Mobile Learning tasks and activities.

Table 1.1: An activity-based categorisation of mobile technologies and learning (Naismith *et al.*, 2006)

Theme	Key Theorists	Activities
Behaviourist learning	Skinner, Pavlov	• drill and feedback • classroom response systems
Constructivist learning	Piaget, Bruner, Papert	• participatory simulations
Situated learning	Lave, Brown	• problem and case-based learning • context awareness
Collaborative learning	Vygotsky	• mobile computer-supported collaborative learning (MCSCL)
Informal and lifelong learning	Eraut	• supporting intentional and accidental learning episodes
Learning and teaching support	n/a	• personal organisation • support for administrative duties (eg attendance)

Future Trends & Challenges of Mobile Learning

As we are moving into a new era of mobile computing, one that promises greater variety in applications, highly improved usability, and speedier networking (Godwin-Jones, 2008), researchers predict a future convergence network that could possibly contribute to learning on the move without restrictions. Mobile technologies are becoming more entrenched, ubiquitous and networked, with expanded and superior capabilities and capacities for great social interactions, context awareness and internet connectivity. Such portable technologies can have a huge impact on education and learning. Accordingly, learning will go more and more beyond the realm of the classroom and into the learner's environments, both real and virtual, as a result becoming more situated, personal, collaborative and lifelong (Naismith *et al.*, 2006; Norazah Mohd Nordin *et al.*, 2010; Ros i Solé, Calic, & Neijmann, 2010). Indeed, learning and teaching with mobile technologies is beginning to make a breakthrough. The challenge would be to explore how to use mobile technologies to transform learning into an inevitable seamless part of daily life to the point where it is taken for granted.

There are quite a number of challenges with Mobile Learning regarding all the available mobile devices and their contribution toward Mobile Learning. The major challenges facing stakeholders and students are as follow (Jacob & Issac, 2008):

Adaptive Learning – This demands that the instructional strategies and learning content should be designed to adapt to the learner's profile and personal needs. Thus, to make up for adaptive learning, the learners' location needs to be taken into consideration.

Limited Text Display – The exploration of how mobile devices could support in providing continuous learning activity during the learning courses or a standalone learning module is crucial.

Instant Communication – Location and response time are crucial factors in supporting the success of good academic interaction and learner satisfaction. Prompt interaction among learning peers could be built in by the mobile communication network by utilizing the prompt

notifications of message reception. Also, global interfaces through languages and cultural contexts pose challenges in regard with Mobile Learning implementation.

Summary

As it was a discussed, learning technologies such as computers, shrinking in size but expanding in capabilities, are offering striking and conspicuous learning applications, i.e., learning applications have moved from desktops to palmtops with unsurpassed capabilities in terms of providing technology-enhanced learning. As a result, Mobile Learning as a new trend in learning has emerged and attracted a lot of attentions and accordingly some researchers have taken the opportunity and initiated some studies on Mobile Learning with encouraging and promising findings, though with mixed results. In addition, Mobile Learning can be championed by different learning theories namely, behaviourist learning, constructivist learning, collaborative learning, situated learning and informal lifelong learning. However, although some researchers have conducted studies in this vein and highlighted the prominent function of Mobile Learning, to marry the research results and real practice of Mobile Learning in classroom and other environments, yet first-hand empirical studies are needed to be conducted. Furthermore, as the concept of Mobile Learning differs from the point of view of researchers, in turn its real practice and application can vary from community to community, that is, there is no one size fit all application in regards with Mobile Learning. Thus, to initiate Mobile Learning in Malaysian context, some studies are crucial to be undertaken in order to explore the use and uptake of new learning applications, offered by mobiles and tablets.

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{ Chapter Two }

Mobile Learning Research Initiatives in Malaysia

Mohamed Amin Embi, Norazah Mohd Nordin & Ebrahim Panah
Universiti Kebangsaan Malaysia

Introduction

Given the paramount importance of technologies such as mobiles and tablets in learning and education, without exception, Malaysian learning context needs to be prepared to embrace the new emerged learning technology, i.e., Mobile Learning. As the Malaysian government has put forth the vision 2020 as a national aspiration, to contribute to achieve this national goal, coupled with the fact that Mobile Learning is at its embryonic stage in this country, studies and research initiatives are critically needed to be undertaken. More recently, some Malaysian researchers have conducted ground breaking research studies in this area and have come up with promising and encouraging, albeit mixed results, as they highlight that Mobile Learning is perceived positively (Hashim, Wan Fatimah & Rohiza, 2010; Ismail, Gunasegaran, Koh & Idrus, 2010; Issack, Mussawir & Ramsawok, 2006; Jacob & Isaac, 2008; Naji Shukri & Abdul Razak, 2011; Norazah Mohd Nordin, Mohamed Amin, Ruhizan, Saemah & Melor, 2010; Zoraini Wati, Norziati & Ghang, 2009). When it comes to the real practice of Mobile Learning in classroom or/and out of classroom, because of many affecting factors including challenges facing students, Mobile Learning application is sluggish and scarcely reported here and there. To see how and to what extent the researchers have addressed the challenging issues and gaps explored in this vein, this edition has compiled 11 selected research studies conducted on Mobile Learning in Malaysia. Prior to presenting the summaries of the latest studies on Mobile Learning, the issue of Mobile Learning is discussed in relation to the future aspiration and goal of technology-enhanced education and learning in Malaysia.

Mobile Learning in the Malaysian Context

The National Higher Education Plan (PSPTN), Ministry of Higher Education (MOHE), is a document that translates the direction of national higher education for the future that focuses

on the development of quality human and intellectual capital. This is to realize the country's aspirations to become a developed, prosperous, and competitive nation.

To ensure that the implementation of PSPTN is according to the set phases, the Ministry of Higher Education (MOHE) has developed 21 Critical Agenda Projects or CAPs. Each of these CAPs has strategic objectives, indicators, and targets to be achieved through various planned activities. These activities must be executed either at the Ministry level or at the agency level, including all agencies under MOHE, which includes all Higher Education Institutions (HEIs).

Since Mobile Learning, as a brand new trend emerging from e-learning has been identified as one of the Critical Agenda Projects (CAPs) and Key Result Area (KRA) of MOHE, using portable technologies such as mobiles and tablets as learning enhancing technologies, in the context of a developing country like Malaysia often remains unrealized, because lack of access, bandwidth and cost to students are challenging factors. However, most students have mobile phones, thus providing an ideal opportunity for HEIs to increase the effectiveness of learning. To fulfil vision 2020 and bridge the gap between research findings and real application of Mobile Learning in Malaysia, some studies have been conducted in this vein. The followings are some selected research studies conducted on Mobile Learning in Malaysia, briefly discussed.

Overview of Studies on Mobile Learning in Malaysia

Given the importance of Mobile Learning, in the Malaysian context, some studies have been undertaken in this area, the summary of which are presented below. In fact, here, the subsequent 11 chapters of the current edition have been roughly summarized for the benefit of the readers.

In a related study, in chapter 3, Afendi Hamat, Mohamed Amin Embi and Haslinda Abu Hassan researched the issue of preparation and readiness for Mobile Learning at Universiti Kebangsaan Malaysia (UKM). Taking into consideration educators' challenges of being familiar with new technology and the impacts of its use on learners, the research objective was to survey the level of readiness for the implementation of Mobile Learning at UKM. Also, to gauge the readiness of UKM's lecturers for the implementation of Mobile Learning. To this end, a 35-item questionnaire on their perception of Mobile Learning and training was distributed among 374 lecturers with the age range of 25-50 plus. The results of the survey show that 65% of the respondents are owners of smart or mobile phones, and that the respondents indicated a favourable perception of Mobile Learning, although 79% of them have never employed it as a method. The favourable perception of Mobile Learning correlates to a favourable experience with e-learning, which suggests that familiarity with teaching via technology, may also play a factor in their responses. The majority (85.7%) also believe that Mobile Learning would be useful for their students, citing its flexibility as the main reason (90.1%). A total of 293 (85.7%) think that Mobile Learning will enhance their students' learning experience.

However, although the study result is promising, since the critical issues of preparation and readiness have been addressed, this study has not delved into the depth of the issue by conducting interviews with some lecturers. In addition, the study has only looked into the perceptions of lecturers, than conducting first hand empirical studies such as observing their real use of Mobile Learning in their classes.

Correspondingly, in chapter 4, similarly, Tan Choon-Keong, Ng Shi Ing and Lee Kean-Wah studied readiness for Mobile Learning in a public university in East Malaysia. The impetus for their research was that Mobile Learning in Malaysia, particularly for learners situated in East Malaysia, remains in the preliminary stage, despite the high penetration of mobile device usage in Malaysia. The main objectives of the survey were to determine the students' readiness for Mobile Learning, the types of mobile devices they used, and the uses of Mobile Learning. the undergraduates' readiness was explored from two angles: (1) their perception of how Mobile Learning facilitates individualized learning and (2) the tools they use for Mobile Learning. In doing so, 900 undergraduate students filled a seven-item questionnaire from which the validity of 713 questionnaires was confirmed. The respondents were from different schools namely, School of Education and Social Development (245 respondents, 34.40 percent), School of Food Science (135 respondents, 18.90 percent), School of Business and Economics (233 respondents, 32.70 percent), and School of Science and Technology (100 respondents, 14.00 percent). Also, female learners (563 respondents, 79.00 percent) outnumbered male learners (150 respondents, 21.00 percent). The majority of the learners were between 21–25 years of age.

The survey results indicated that 287 out of 477 respondents (60.2 percent) had either a tablet or smart phone with Wi-Fi access capability. Of these 287 respondents, 48 respondents (10.1 percent) had a tablet such as a Samsung Tab or iPad. A total of 487 of the 713 respondents (68.3 percent) were registered with one of the authorized internet service providers, Celcom (21.60 percent), Digi (23.70 percent), and Maxis (24.90 percent). Only a smart phone or tablet can deliver Mobile Learning that can interact with the participants and place components in Sharples *et al*.'s (2009) theory of Mobile Learning. In addition, Koole's FRAME Mobile Learning framework on Interactive Learning (IL) highlights the importance of the undergraduates' mental preparation in their acceptance of Mobile Learning. The overall findings of the survey indicated that the students generally viewed Mobile Learning as beneficial and useful. A total of 604 of the 713 respondents (84.71 percent) agreed that Mobile Learning motivates (43.15 percent) their learning. Mobile Learning was also found to be able to improve learners' productivity (85.97 percent) (Item 6), as many learners agreed with the statement that Mobile Learning helped them to complete assignments faster (84.43 percent) (Item 5). All in all, the findings of the survey indicated that the level of the university's IL (Koole's FRAME framework) was at an acceptable level.

However, although the study was comprehensive in terms of coverage (over 700 respondents) with encouraging results, to probe into the depth of the issue a mixed method design in which the qualitative phase corroborate and substantiate the quantitative results is missing.

In a related study, in chapter 5, Azwin Arif, Nor Yazi, Mohammad Radzi, Supyan Husin and Mohamed Amin Embi studied the influence of demographics on Mobile Learning Readiness (MLR) in science and social science undergraduates. The study rationale was the limitation in terms of understanding of Malaysian university students' reception to language learning through Mobile Learning, particularly with regard to identifying demographic determinants or constructs that affect students' intention to use Mobile Learning. The study aimed at estimating the use of information and communication technology (ICT) among the target groups to specifically identify the influence of the two types of backgrounds on mobile-based language

learning acceptance. Physical readiness, skill readiness, psychological readiness, and mobile language-learning readiness were in the centre of attention.

To this end, an exploratory study has developed and validated a framework of mobile language learning for Malaysian students. It attempts to compare MLR between two types of students—those with an educational background in science (n = 36) and those with an educational background in social science (n = 33)—using a Mobile Learning Readiness instrument designed by Supyan Hussin *et al*. (2011). They found that regarding the significant differences of basic physical and skill readiness towards Mobile Learning between students majoring in science and those majoring in social science, the culture of the science field has encouraged its students not only to accept technology more readily but has also called for higher awareness of the need to be technologically competent for the purposes of e-learning. They conclude that there is a need for a specific approach that will cater to students with varying educational backgrounds. Also, this approach is needed for technological proficiency to be stipulated as a key area of competency among Malaysian students.

This study can be considered ground breaking regarded from two aspects. First, in terms of the objective of the study that is seeking for interdisciplinary differences regarding Mobile Learning. Second, in terms of the means of data collection conducted via Google Docs which opens a new chapter in online data collection. However, to delve into the depth of the study the researchers could interview some students as well.

Respectively, in chapter 6, Rashidah Rahamat, Parilah Mohd Shah, Sharifah Nor Puteh, Aidah Abdul Karim, Rosseni Din, Juhaidah Abd Aziz and Zamri Mahamod conducted a study on students' perceptions of a Mobile Learning environment through mobile technology applications. Their motivation was that since the Malaysian school system does not allow the use of mobile phones on school grounds, an alternative way of using the students' mobile technologies for the purpose of learning is needed. One of the mobile applications commonly found on students' mobile phones, SMS, was used as a medium to engage them in learning as part of their course on Literature Components of English. To this end, 26 students were interviewed.

Their findings show that the participants had positive attitudes towards the idea, and they agreed that receiving messages from their teacher would have a positive impact on their learning. These findings have implications for teachers interested in identifying suitable approaches to make the learning process more meaningful by integrating tools that are owned by and familiar to Internet Generation students.

The finding of the study is encouraging, however; there were no experiment and control groups to examine the real effect of this approach of delivering learning content. Also, a survey study through questionnaire with more participants could be valuable in terms of getting into more learners' perceptions regarding Mobile Learning.

In a somehow similar and related study in chapter 7, Nuraihan Mat Daud and Zamnah Hussin conducted a study on the use of mobile phones for reading comprehension course. Their rationale was that although mobile phones are increasingly and frequently used by students, studies on their use to supplement a reading comprehension course are rarely reported in the literature. The main purpose of their study was to determine whether texting reading comprehension exercises to students can contribute to the improvement in their reading performance. It also intended to determine which level of proficiency class would benefit from

such an exercise. To this end, a quasi-experimental design was adopted to determine whether the use of mobile phones contributes to the improvement in learners' reading comprehension. The participants of this study consisted of students who owned mobile phones. Accordingly, 651 students, selected following language proficiency courses (offering language skills and components such as Reading, Writing, Grammar, Listening, and Speaking), at the language centre (CELPAD) of the International Islamic University, Gombak, Malaysia, over 3 months based upon reading scores gains from a pre-test and a post-test. The students were divided into two groups: 438 students in the experimental group and the remaining 213 in the control group. There were 248 male and 190 female students in the experimental group. The sample was taken randomly from each level of the proficiency courses. Reading materials were texted to students in the experimental group everyday for approximately 3 months. To ensure the appropriateness of the reading materials, an online Readability test was carried out.

The data obtained from the pre-test and post-test of the reading comprehension tests were analysed using SPSS. The analysis of results was carried out by comparing the scores that the students obtained in the pre- and post-tests, and the overall score performance (post-test minus pre-test) of the reading comprehension tests. To this end, first, a one-way ANOVA was carried out on the pre-test scores of the reading comprehension test to determine the initial equivalence among the groups who were involved in the text messaging activity. It is assumed that the significant difference in at least two group means is due to the fact that the groups involved were from different levels of English proficiency. In order to determine which specific groups differed from each other, a post-hoc test was carried out.

There were significant differences between the groups as a whole in terms of their overall performance in the pre-test of the reading comprehension paper. Almost all of the English language proficiency courses, regardless of higher or lower proficiency levels, showed significant differences in the mean score performance in the reading comprehension post-test. There was an overall improvement in the performance of the students based on the comparison of the mean scores of the reading comprehension pre- and post-tests.ie., they showed an improvement in their reading scores.

However, although the results suggest there was an overall improvement in reading comprehension, a one-way analysis of variance, comparing the means of difference in the reading comprehension pre- and post-tests, indicates that the variance in the scores was low: $F(4, 433)=2.03$, $p<.05$. This suggests that although there was an improvement in the reading comprehension ability across the groups that participated, the increase in scores was not statistically significant. The ANOVA analysis indicates that there were significant mean differences across the population regarding the English language bands obtained in the reading comprehension pre-test. The analysis of results indicates that, on the whole, students who participated in the study were able to perform better in their reading comprehension paper. Although there was an improvement in this study (SMS reading activity), students were not able to achieve significant gains in reading comprehension. One of the reasons for the small gains in reading comprehension might be due to the short treatment period of approximately 3 months carried out in this study.

In sum, as the study results demonstrate, Mobile Learning using mobile devices can assist students to achieve their learning objectives including reading comprehension owing to the flexibility of the format for the transmission of knowledge. These findings also suggest that there

is a potential in using mobile phones to supplement classroom learning. Thus, the extensive reading programme via mobile phone demonstrated that such an activity is pedagogically beneficial to the learners.

While this study is with encouraging and promising results and enjoys a great deal of the reliability and validity in the whole research procedure, and also is a quite new area of study on Mobile Learning for reading comprehension course, yet it has only looked at the use of SMS as a means of texting via mobile. It could also look into other functional and valuable applications offered by mobiles and tablets (such as using the net, PDF, etc.) which can promote reading comprehension skill in students.

Similarly, in chapter 8, Rozhan Idrus studied Mobile Learning in distance education thereby examined SMS application in a physics course. The rationale for the study was that distance education is now synonymous with the concept of Mobile Learning, as distance learners engage in vocations initiating and structuring their learning experience beyond the limitations of the classroom. The study aimed at gauging students' perceptions of this unique use of SMS to facilitate learning. The aim of this project was to incorporate learning via SMS. To collect the data, 17 students, taking JIF 212 physics second-year course, filled ten-item questionnaire.

The findings of the study indicates that thirteen students responded to the questionnaire, yielding a return rate of 76%. The overwhelming consensus suggests that the mobile phone could make a strong and viable contribution to learning in a distance education physics course; The results of this study testify to students' acceptance of the use of the mobile phone in learning, indicating greater motivation, support, and convenience in learning. Also, the results of the study suggest Mobile Learning designed and developed pedagogically and incorporating modular instruction and the dynamics of learning could prove to be an effective tool for distance learning.

While the result of the study is encouraging and paves the ground for further research in this vein, students' perceptions of other applications of Mobile Learning yet to be explored. In addition, regarding the generalization of the result of the study to the greater population care should be taken, since the sample size was small.

Correspondingly, in chapter 9, Faizah Abd Majid conducted a case study on adult learners and Mobile Learning. Her motivation was that as Mobile Learning is fairly new to many university instructors in developing countries including Malaysia, there is also a strong likelihood that mobigogy is also unfamiliar. Also, very little has been done to investigate the effect of Mobile Learning among adult learners (i.e. learners who are past the usual university age and are not engaged in the normal academic programme but in special adult education programmes) in the Southeast Asian context. Given this fact, the research objective was to investigate the perceptions of trainers or facilitators involved in a special adult education programme offered in a Malaysian public university.

To this end, four female teachers took part in a 1.5-2 hour semi-structured interview. Also, lesson some plan samples were analyzed. In addition, students' SMS, face book, and Tweet use were discussed. Moreover, document analysis and thematic analysis were used. She found that teachers' understanding of Mobile Learning and andragogy is still superficial. Also, the teachers lack the resources and creative strategies to successfully implement Mobile Learning among adult learners (need for training in mobigogy). In addition, to the participants, Mobile Learning is seen as similar to e-learning, ease of communication with their students and the students'

ability to download materials uploaded by the teacher. They were also more comfortable with emails and online materials viewable on a desktop or laptop browser. Greatest challenges were giving effective responses/feedback and ensuring that their materials meaningfully supported learning. The adult learners were not able to fully maximise their potential as adults. Both the participants (facilitators) and the adult learners may lack 'technology literacy'. Lecturers who claim to be implementing Mobile Learning may not really be doing so, but instead essentially be implementing e-learning.

Nevertheless, although the study was rewarding, it has some limitations. For example, the entire participants were female and the total number of participants was four. Furthermore, the study was not with a mixed approach design covering both qualitative and quantitative phases.

In the same vein, in chapter 10, Sakina Baharom and Raja Maznah Raja Hussain conducted a study on exploration of the Mobile Learning environment to support teacher training. Their rationale was that the vision of Mobile Learning will fail if teachers are not ready to embrace the current technology in delivering their daily lessons. The purpose of the study was to extract rich findings that would help them understand how the mobile phone can be used as a learning tool. In fact, they were seeking to answer the 'how' and 'what' questions. To collect the data, 73 third year teaching of English as a Second Language (TESL) trainee teachers studying at the faculty of education at University of Malaya participated in an exploratory case study. They were provided with a three-hour workshop. Also, needs analysis were conducted. Two needs analyses: one on the students (student teachers) and the other, on their virtual learning environment. The students filled paper-based Mobile readiness questionnaire. Also, students' individual blogs were used to explore their perceptions on the use of Mobile Learning.

The results of the questionnaire showed that the participants used their mobile phones mostly to make and receive calls (97.1%), send and receive SMS (95.7%), and use the phone calendar (72.9%). They also indicated that the most beneficial Mobile Learning activities were receiving notices about their course through SMS (67.1%), capturing videos or pictures for their assignments (57.1%), and sending questions through SMS (50%). The findings of blogs show that some teacher trainees said that they had already been using their phones for learning, but only became aware of it after the Mobile Learning workshop. This study shows that HEI (Higher Education Institution) teacher trainees are open to Mobile Learning to support their learning.

However**,** the following challenges need to be addressed. A crucial one is capitalising on the flexibility and freedom afforded by mobile phones, and new pedagogies and approaches are thus very much needed to facilitate the course instruction. There is also a need to design learning activities that will build new learning processes via the mobile device while complementing the existing technologies with which HEI students are familiar. HEI teacher trainees want to use their mobile phones to access their course content as regards the administration of the course or course notes, but emphasise the need to take a second look at the issue of cost. Thus, teachers in schools or educators in HEIs, particularly those who train future teachers, will have to discover new ways in which the functionality of the device can be applied to support learning, in order to create new pathways that are more situated, personal, collaborative, and long-term.

Likewise, in chapter 11, Irwan Mahazir, Azwin Arif, Norazah, Din, and Mohamed Amin Embi studied Mobile Learning development and evaluation framework for a performance-based environment in technical and vocational education and training (TVET). The rationale was that,

based on the results of the survey, the teachers at the given polytechnic were still employing teacher-centred learning methods using demonstrations or demonstration methods in teaching Computer-Aided Design (CAD). They decided that there is a need for development and evaluation of framework. Accordingly, the research objective was to examine the development and evaluation of a framework for Mobile Learning in a particular environment, in a particular subject, in a polytechnic in Kedah. The study was designed to evaluate the impact of Mobile Learning on student performance, problem solving, and information management; it also evaluated the effectiveness of the strategies implemented in the prototype on the respondents. The study evaluated and adapted the findings of previous studies to propose a Mobile Learning framework for development and evaluation for a performance-based environment in (TVET). The framework, to be used in a performance-based environment, takes into consideration aspects such as technical factors, environment factors, and student demographics. Some polytechnique students took part in an experiment.

They found that ADDIE model was suitable and effective for use in the development of the prototype. A performance-based environment will ensure that instructors focus not only on how to convey information but on student performance, as well, while focusing on meaningful learning. The implication of this research is that it may be used to define and assist in developing learning materials that suit Mobile Learning activities.

However, although the result of the study in relation to mobile using framework is promising, careful and purposeful planning is needed to evaluate the usefulness of the framework in a given context.

In a related study, in chapter 12, Sazilah Salam, Saharah Be Sahul Hameed and Norasiken Bakar studied a new approach for Mobile Learning known as mobile pedagogical agent. The impetus of the study was founded on some concepts such as collaborative learning vs. Individual learning. Also, the rationale was that students cannot necessarily rely on their peers for accurate information. However, consistent access to an MPA (Mobile Pedagogical Agent) allows students an alternative research tool. An Intelligent Tutoring Systems (ITSs), ensuring both knowledge acquisition and tutoring (knowledge-based systems vs. conventional programs) was needed.

The objective of the study was to discuss the design and architecture of a Ubiquitous Knowledge Acquisition System (UKAS), an MPA. Thirty students participated in the study. Two groups of students namely; experimental group with MPA and control group without MPA were the participants. Pre-test and post-test were used. The data show that the experimental group noticeably outperformed the control group. Accordingly, the study promotes a new approach for implementing MPAs in a virtual collaborative learning environment in order to improve learning with technology.

The study provides a supplementary to the concept of collaborative learning via technology. It could be a good idea to evaluate the function of the system across different disciplines.

In a related work, in chapter 13, Sazilah Salam, Tarisa Makina and Norasiken Bakar studied the efffectiveness of a Web-based Mobile supported Learning Management System. Challenges in relation to collaborative and cooperative learning were among their motivations for the study. The study aimed at proposing a Web-based model intended to support maximum performance in cooperative, technology-supported learning. Learning style and cognitive style on learning when engaging in a cooperative learning activity were taken into consideration. The

study theoretical frameworks were (1) one that ignores learning style but considers cognitive style (MOF), (2) one that considers both learning style and cognitive style (AF), (3) one that ignores both learning style and cognitive style (MONF), and (4) one that considers learning style but ignores cognitive style (ANF).

To collect the data, 47 engineering students took part in the study. There were experiment group and control group. The study duration was 4 weeks. To analyze the obtained data t-test was employed. They found that (1) students' prior knowledge on all topics was equal, (2) the effect of learning style on LAT score, was observed (3) the effect of cognitive style on LAT score was also noticed (4) students' performance in a less preferred learning environment was not noticeable, while (5) students' learning performance was best when they learned in an environment which considered cognitive style and learning style. The non-significant result indicates that cognitive-style implementation did not affect students' expert learning performance. Implementation of a cognitive style in a learning environment successfully improved 28% of students' tutored performance.

The reviews, proposed learning model, prototype, framework, and findings of the study provide broad theoretical and instructional-design implications. Future study to evaluate other elements within the model should therefore be conducted. In addition, to get into students' perceptions, the researcher could probe into qualitative aspect of the study (through interview) as well.

Summary

All in all, the studies conducted on technology-based learning in general, and on Mobile Learning, in particular, are regarded as ground breaking and promising ones in Malaysia. However, in spite of the hype around how Mobile Learning can make learning and education more accessible and vigorous in the developing countries including Malaysia, as technology-fed devices such as mobiles and tablets are viewed as the 'personal computer' of the students owing to their increasing pervasiveness there, more rigorous studies are clearly called for to marry the research findings and students' real practice in classroom and also when they are on their own.

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{ Chapter Three }

Preparing for Mobile Learning: A Readiness Study at Universiti Kebangsaan Malaysia

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Introduction

Recent advances in technology have allowed the rapid miniaturisation of various computing devices. These mobile computing devices, in various forms, such as tablet computers and smart phones, have not only been a viable platform for carrying out various tasks that could not previously be done when on the move, but have rapidly improved in terms of usability, processing power, and connectivity. While tablets and smart phones have existed since the 1990s, the introduction of Apple's iPhone and iPad in the mid-2000s probably provided the major impetus for renewed industrial interest in mobile devices. The aim of creating usable, well-connected mobile devices is not a far-fetched vision anymore; it is already a reality. The availability of these convenient platforms, however, brings about a new set of challenges for educators and trainers. Learners are getting more familiar with mobile gadgets, and as a result, their preferences and methods for knowledge acquisition and sharing are changing. Educators will have to face the challenge of being familiar not only with new technology, but also with how its use affects learners. At Universiti Kebangsaan Malaysia (UKM), the use of Mobile Learning is in its early gestation; very few lecturers have actually used it in class or researched it deeply. This chapter presents the findings of a survey carried out to gauge the readiness of UKM's lecturers for the implementation of Mobile Learning.

Ally (2009) defines Mobile Learning as the delivery of learning content to mobile devices. This is a usable bare-bone definition of Mobile Learning; however, Mobile Learning is also much more than that. Sharples *et al.* (2007) argue that in Mobile Learning, context is given primacy over other factors, because Mobile Learning supposedly allows for the contextualisation of learning in ways that are not possible with traditional learning or e-learning. The MoLeNET program defines Mobile Learning as 'The exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning' (MoLeNET, 2007). This definition cuts directly to the issue of technology and touches on one crucial aspect of mobile handheld technology: ubiquity.

The value of the mobile device market is expected to be about $341 billion by the year 2015 (Markets & Markets, 2011). This is a huge and highly competitive market, and as a result, the prices for entry-level devices (which should be noted, have much the same functionality as more upmarket alternatives) are within the means of the general consumer and even university students. This means that universities in Malaysia have the opportunity to begin developing Mobile Learning content and infrastructure, as their students should be ready to capitalise on Mobile Learning if it is available.

It is instructive to bear in mind the similarities between the fields of e-learning and Mobile Learning which share roots within the umbrella concept of distance education (Gladieux & Swail, 1999). This means that institutions can leverage any existing base of expertise and experience in e-learning to adopt and implement Mobile Learning. The personal nature of mobile phones and their portability suggest that Mobile Learning may have even bigger potential than e-learning (Vogel *et al.*, 2010).

Methodology

Data was collected through an online survey carried out over a period of one month. A 35-item questionnaire was used to gather responses from the sample population. A total of 374 lecturers responded from a surveyed population of 1500 academic staff. Of the respondents, 61.1% are women and the rest are men. Their age breakdown is as follows: 25–30 (8.6%), 31–40 (37.5%), 41–50 (38.7%) and over 50 (16.1%). By level of teaching experience, they can be categorised as follows: less than five years (23.9%), 6–10 years (19.8%), 11–15 years (25.7%), and more than 15 years (30.6%).

Findings

The respondents generally seem to have adequate familiarity with e-learning. Table 3.1 shows their level of experience in using e-learning; additionally, it appears that only a small minority have not used it before.

Table 3.1: Past experience with e-learning: 'Have you used e-learning before?'

Yes, the system provided by the university (SPIN)	59.3%
Yes, external systems/free services such as blogs, wikis, etc., that are available online outside of UKM.	31.1%
No	9.6%

The fact that the majority of the respondents have used e-learning before means that they have already been exposed to the use of information and communication technology (ICT) for learning. This may explain their responses when asked if they would utilise Mobile Learning if it were made available at UKM. A total of 90.9% of respondents answered the question positively. This is despite the fact that 79% of them have never utilised Mobile Learning as

learners themselves and 84.8% have never used it to teach their students. This is in line with previous literature that views Mobile Learning as an extension of e-learning or online learning (Yamaguchi, 2005), and thus indicates that exposure to e-learning will ease adoption and improve perception of Mobile Learning.

The respondents were also asked if they think that Mobile Learning will enhance their students' learning experience. A total of 293 (85.7%) of the respondents answered 'Yes' to this question. The reasons for these positive responses, chosen from a set of options, are shown in Table 3.2.

Table 3.2: Reason for choosing 'Yes'

Options	Percentage
It is a convenient way to learn, as most of my students use mobile phones/smart phones.	76.9%
It will make learning more flexible.	90.1%
I think it will make learning more interesting/enjoyable.	79.6%
It will help with better understanding of learning materials.	46.6%
I think my students will enjoy using their phones and mobile devices for learning.	76.2%
Other (please specify)	7.1%

It seems that the lecturers recognise that the major advantage of mobile technology for learning is that it confers a greater degree of flexibility for both learners and teachers. Mobile Learning has often been associated with the 'just enough, just in time, and just for me' model of content delivery and interaction. The affordance by Mobile Learning of a flexible (albeit limited compared to face-to-face interaction) method of content delivery, content creation, and class-related communication is recognised by the respondents, who also gave a high rating to the option 'I think it will make learning more interesting/enjoyable' (79.6%). This may be because the respondents view Mobile Learning as something novel and therefore more interesting and enjoyable than desktop or laptop computer–based e-learning. This observation is supported by the fact that 76.2% of the respondents believe their students would enjoy using mobile devices for learning. It is important to note that even though the majority have not experienced Mobile Learning themselves as learners, they have a favourable view of it as a concept. Their lack of experience probably explain their low agreement on the item 'It will help with better understanding of learning materials' which scored only 46.6%. As educators, they are probably aware of the value of instructional design for the production of useful learning materials, and know that a simple change of form (from computer screens to smaller mobile devices) will not promise better user uptake or understanding of learning materials.

The respondents were next asked about device ownership. This is an important point to look at to determine whether respondents have the necessary tools in hand to engage in Mobile Learning. Table 3.3 shows the breakdown of device ownership among the respondents.

Table 3.3: Device ownership

Device	Ownership
Mobile phone	65.2%
Smartphone (mobile phone with more advanced hardware and expanded internet capability such as the iPhone or Blackberry)	52.1%
Personal Digital Assistant (PDA)	7.9%
Tablet or e-book reader (e.g.iPad, Kindle, Slate)	12.2%
Portable Music/Video Player (e.g. iPod, Zune)	7.9%
Netbook	19.5%
Notebook or Laptop	89.5%
Desktop Computer/Personal Computer	77.9%

As Table 3.3 shows, level of device ownership is highest for notebooks and laptops (89.5%), followed by desktops at 77.9%. The majority of UKM's lecturers own computers, as do their counterparts from elsewhere around the region. However, only half of them (52.1%) own smart phones, the main current vehicle of mobile content delivery. Ownership of tablet computers and e-book readers is also low, at only 12.2%. Some researchers and tech-writers may argue that we now exist in a 'post-PC' world; and while this argument has important implications for device manufacturers who will need to focus their R&D efforts accordingly, the introduction of Mobile Learning should be gradual so as not to totally cut off older, less mobile, but not totally mobile-incapable technologies. This can be achieved by the development of mobile web apps (see below) instead of traditional, platform-specific apps such those as found on most iPhones and devices running the Android operating system. Mobile web apps are websites or web applications designed to run well on mobile devices primarily but to still be usable on traditional desktop computers or notebooks. Jenson (2011) argues that the 'just-in-time' interaction model of mobile devices is best expressed in the form of mobile web apps rather than normal mobile apps. Furthermore, from the development point of view, it is much more economical to develop, once, a program that can be run on multiple mobile operating systems than to have to produce multiple versions. Another advantage is that mobile web apps can be developed using tools that have already matured, such as HTML, CSS, and JavaScript. This means that most web developers will be able to contribute to mobile app development without having to learn radical new skills for each platform.

This is the approach taken by UKM's first mobile web app for training, the JiT2U training series (http://jitzu.ukm.my). The JiT2U web app is designed to be used on mobile smart phones running Android, iOS, Blackberry OS, or Symbian S60. However, it also runs perfectly well on desktop in the latest versions of modern browsers such as Chrome, Firefox, and Safari. The development process was much simplified, as the team could focus on developing for the common feature sets of the browsers in question as opposed to for each specific browser. For this advantage to be utilised effectively, users must be aware of the choice of browsers available for their mobile devices. When asked if they use mobile-specific browsers such as Firefox for Android or Opera Mini, only 34.8% of the respondents said they do, while 35.5% said they use the default browser that comes with their mobile device. This indicates a need to raise awareness of the availability of mobile alternative browsers among UKM lecturers. In the long

run, this will make it easier to develop content, as alternative mobile browsers adhere better to standards that can be used as a benchmark for development.

Apart from their normal duties of teaching, researching, and publishing, academic staff at UKM are also expected to undergo periodic training to further enhance their professional development. When asked if they are favourable to the idea of providing mobile-optimised content as an additional option for their training, 81.5% of the respondents said 'Yes', 9.1% said 'No', and 9.4% said 'Not sure'. The majority of those who chose 'Not sure' commented that they have no idea what Mobile Learning is capable of and are therefore unable to decide. It seems that more must be done to raise awareness of the benefits and challenges of Mobile Learning, as this will better prepare staff to utilise it.

The respondents were also asked about the content format that they believe will be most suitable for their training needs. Table 3.4 shows their preferences:

Table 3.4: Preferred content format

Text only	3.7%
Text with limited media (e.g. images only)	21.8%
Text with full multimedia (audio and video)	53.5%
Multimedia with limited textual content	7.4%
Not sure	13.5%

The majority of the respondents chose 'Text with full multimedia' as their preferred content format. This format plays to the strengths of mobile devices, as the limited screen size makes long texts unwieldy for users. The combination of text and full multimedia also adheres to the 'just-in-time' principle by catering to different user preferences, as users can read as well as interact with multimedia content. However, two challenges are presented by the findings in Table 4. First, the development of multimedia materials is neither cheap nor easy. It uses many resources, especially money and time, and requires thoughtful planning to be effective. At UKM, the primary mode of teaching is still face-to-face, and the e-learning culture has not evolved sufficiently beyond posting of classroom resources online using the previous learning management system (SPIN). There are exceptions to this; however, the number is still rather small. To produce and make use of high-quality multimedia materials for learning and training, there must be a concerted effort by the university administration to provide enough resources. Second, multimedia playback requires mobile devices with adequate processing power and screen size. Implementing multimedia-oriented Mobile Learning and m-training would first require the wide availability of such devices among the target population (lecturers and students at UKM).

The respondents were also asked about what functions and services they believe are needed for the successful implementation of Mobile Learning at UKM. Table 3.5 shows their responses:

Table 3.5: Respondents' views of functions and services needed for the successful implementation of Mobile Learning at UKM

It must be integrated with the e-learning/e-training platform of the university.	84.3%
It must be able to support traditional learning, for example by providing supporting educational information like timetable, lecture topics, test dates, exam results, etc.	79.7%
It must provide convenient access to learning materials that is tailored to the interface of the mobile devices.	77.8%
It must be capable of sending information regularly via MMS/SMS.	60.9%
It should allow users to download or read off-line files or materials on mobile devices.	66.8%
Information presented should be clear/brief/suitable for the mobile device interface.	69.8%
It should allow faster communication between students and teachers/trainers.	78.2%
It should facilitate collaboration between students.	64.6%
It should allow for quizzes or tests to be taken via mobile device.	34.5%
Other (please specify)	3.1%

The respondents gave a high rating to the idea of integration between the existing e-learning platform and Mobile Learning. This is in line with the view that Mobile Learning should be an extension of e-learning technology already employed by the institution. This approach would also be beneficial in the sense that it can provide coverage through a wider spectrum of delivery methods and thus will not be a burden on those without sophisticated mobile devices. The findings also indicate that the issue of the mobile interface is a priority for the respondents, as 77.85% of them believe that learning materials should be made suitable for delivery on mobile devices. A total of 77.9% of the respondents also want the Mobile Learning platform to be able to support traditional learning by providing supporting educational information such as timetables, lecture topics etc. In this role, the Mobile Learning platform becomes an assistive technology for the traditional method of course delivery at UKM, which is still predominantly face-to-face. In organisations where Mobile Learning is being introduced, this assistive role should be one of the first steps focused on to gain the trust of the user.

Conclusion

This chapter has given an overview of the level of readiness for the implementation of Mobile Learning at UKM. The core of the chapter looks at a survey conducted to assess the readiness of UKM academic staff for Mobile Learning. The results indicate that the lecturers view Mobile Learning favourably, and yet there are a few challenges to overcome. The most immediate issue is the lack of awareness among staff on the benefits and shortcomings of Mobile Learning.

Another important issue is that the level of ownership of mobile devices is still quite low. If UKM is to implement Mobile Learning, it has to give priority to solving these issues.

The issue of the lack of awareness can be dealt with using common solutions, such as carrying out road shows, seminars, and talks at the institutional level. It is also imperative for UKM to have a working definition of Mobile Learning, to clarify this concept for people who are becoming aware of it. As discussed earlier, in the introduction, Mobile Learning is defined differently by different people and organisations. If UKM can uphold its own working definition of Mobile Learning, this will allow for proper focus in terms of resource utilisation, training, and development.

The issue of low penetration of smart mobile devices can be alleviated by the development of strategic partnerships with various telecommunications providers and device makers. However, this may involve policies that are beyond the scope of the discussion in this chapter. Capable smart devices are becoming more affordable, as noted earlier in the chapter, and manufacturers vying for a bigger slice of the market often introduce devices at different price points to ensure that there is a model for every need. Entry-level smart devices are likely to become more and more affordable in the future. There are also new, exciting developments on the technical front that may help to widen device ownership among the lower-income group. One such development is the Firefox OS (formerly known as Boot2Gecko or B2G), produced by the Mozilla Corporation. Firefox is open source and innovatively uses HTML5 to provide a complete operating system for mobile phones. It is also designed to cater to 'emerging markets and budget-conscious customers. It is slated to be available in 2013 and should provide a viable alternative to the higher-end iPhones and Android phones.

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{ Chapter Four }

Readiness for Mobile Learning at a Public University in East Malaysia

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Introduction

The use of Mobile Learning is not exclusive to current learning trends; it has occurred throughout different periods as a means for humankind to learn using technology. For example, the abacus, the first 'portable tablet' invented by the Romans around 300 B.C., was used by traders and financiers to overcome the limited number of human digits for tabulating large numbers (Fernandes, 2010). The significance of the abacus, however, is not its ability to help calculate large numbers, but its facilitation of the learning and mastery of complex mathematical calculations on the go, or mathematical Mobile Learning. In the 21st century, exploration of the capabilities and implications of Mobile Learning has increased as a result of mobile technology advances, in which desktops are being replaced by tablets, software by apps, and mobile phone by smart phones. In 2011, consumers purchased 68.7 million tablets and 1.5 billion smart phones, mainly to text and access entertainment or social media (mobiThinking, 2012).

Malaysian consumers demonstrated positive growth in the information technology and telecommunications sectors in the 1st quarter 2012, with 24% and 61.7%, respectively, according to the GfK TEMAX report (AdoiMagazine, 2012). This notable growth indicates the increasing affordability of technology, which allows consumers to participate in a constantly evolving web of communication. Shepherd (2001) reported that mobile devices have become the tool of choice for citizens on the go. Commutes and personal waiting times provide opportunities for mobile devices to mediate personalized Mobile Learning. Mobile Learning is regarded as the next step towards ubiquitous learning, which will enable citizens to participate in trade in the knowledge economy (Saadiah Yahya *et al.*, 2010). However, research on Mobile Learning in Malaysia, particularly for learners situated in East Malaysia, remains in the preliminary stage, despite the high penetration of mobile device usage in Malaysia (Zoraini Wati Abas *et al.,* 2009).

This chapter addresses one of the many issues pertaining to Mobile Learning from the perspective of undergraduates at University Malaysia Sabah, East Malaysia. The preliminary

research study delves into the undergraduates' readiness to adopt Mobile Learning as part of their university courses. Their readiness is explored from two angles: (1) their perception of how Mobile Learning facilitates individualized learning and (2) the tools they use for Mobile Learning. The remainder of this chapter provides a review of the relevant literature on mobile technology and Mobile Learning, including a definition of Mobile Learning, followed by learning theories supporting Mobile Learning, the framework employed for this preliminary research, importance of Mobile Learning in Malaysia, methodology of this research, findings and discussion, and conclusion.

Literature Review

Defining Mobile Learning

The term 'mobile' often brings to mind the image of a cellular phone and the concept of undeterred communication freedom. Quinn (2000, p.35) echoes this notion by describing Mobile Learning as 'e-learning through mobile computational devices… even your digital cell phone'. Chong *et al.* (2011) builds on Quinn's statement by stating the method of Mobile Learning is aided by a connection system, that is, wireless local area network or Wi-Fi. Dye *et al.* (2003) broadens this definition to include the spatial dimension (*place*), a wider range of mobile tools in Mobile Learning (*paraphernalia*), and the immediate stakeholders of Mobile Learning (*participants*), as shown in the following statement:

> *mLearning is learning that can take place anytime, anywhere with the help of a mobile computer device. The device must be capable of presenting learning content and providing wireless two-way communication between teacher(s) and student(s). Typically, an educational organization administrates both the course content and the communication services.*
>
> *(Dye et al., 2003)*

Here we consider that Mobile Learning is shaped through the combination of place, paraphernalia, and participants (Figure 4.1).

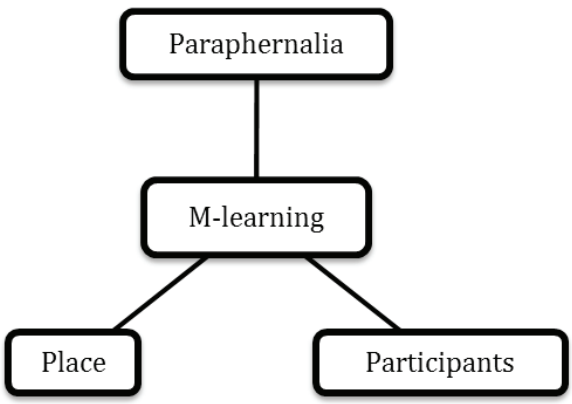

Figure 4.1: Manifestation of Mobile Learning through paraphernalia, place, and participants

Learning arises from the manipulation of a physical and virtual medium to form meaningful and personalized knowledge for an individual. Mobile Learning is facilitated by learners augmenting 'personal and public technology' through places and spaces to gain novel information and skills (Sharples et al, 2009, p. 235). It imbues the following principles:

> **Mobility in physical space:** *People on the move try to cram learning into the gaps of their daily lives or to use those gaps to reflect on what life has taught them. The location may be relevant to learning or merely a backdrop.*
> **Mobility of technology:** *Portable tools and resources are available to be carried around, conveniently packed into a single lightweight device. It is also possible to transfer information across devices, moving from the laptop to the mobile phone to the notepad.*
> **Mobility in conceptual space:** *Learning topics and themes compete for a person's shifting attention. An adult encounters numerous learning episodes, and thus, his or her attention shifts according to personal interests, curiosity, or commitment.*
> **Mobility in social space:** *Learners perform within various social groups; they have encounters within the family, office, or classroom context.*
> **Learning dispersed over time:** *Learning is a cumulative process involving connections and reinforcements amongst a variety of learning experiences (Dierking et al., 2003) across formal and informal learning contexts.*
>
> *(Taken from Sharples et al., 2009, p. 235)*

The definition of Mobile Learning in this paper is based on principles that shape such learning, including those described by Sharples *et al.* This perspective is selected because the study focuses on learning matter as affordances rendered by technology through context.

The definition of Mobile Learning has evolved from one that considers technology features to one that includes technology features scaffolding and extended learning opportunities. This Mobile Learning model, in addition to including a high level of flexibility for learners, also consolidates 'transformative innovations for learning futures' (Pea & Maldonado, 2006, p. 437), where it is 'just in time, just enough and just for me' (Peters, 2007, p. 15).

Theories Behind Mobile Learning

As Mobile Learning is a new learning model, the theories needed to support it should reflect the criteria particular to Mobile Learning. In the definition employed here, the three categories, participants, place, and paraphernalia, become the guiding factors to select suitable pedagogical theories to support the expansion of Mobile Learning to fit curriculum design, methodology, and learning assessment and evaluation. These categories are further elaborated according to Norazah Mohd Nordin *et al.*'s (2010) and Sharples *et al*.'s (2009) discernment on factors shaping Mobile Learning pedagogical theories.

Table 4.1: Elaboration of participants, place, and paraphernalia

Category	Elaboration
Participants	Learners are 'on-the-go'. 'On-the-go' not only refers to their physical movement—mobility—from point a to b but also exploratory communication with similar learners, which exhibits social constructivist and collaborative learning to form new experiences between multiple topics, as communication is deemed educative (Dewey, 1916).
Place	The physical borders of learning have disappeared in the face of ubiquitous learning. Learning is not confined to the physical classroom; instead, the environment becomes the classroom. Learning space is defined by the dimensions (i.e. physical and virtual) and modality-afforded semiotics (i.e. text, images, aural, space) accessed by learners and teachers to form 'a distributed system of meaning making that promotes collaborative knowledge building' (Sharples *et al.*, 2009, P.237).
Paraphernalia	Paraphernalia does not refer to the devices but encompasses a larger element, that is, materials for delivering learning and features in tools that facilitate learning. The design of paraphernalia depends on how learners respond and use the devices to build new knowledge. Positive behavioural change affecting knowledge building can be achieved if learners experience ease of use and practicality of paraphernalia during learning.

These factors shape Mobile Learning pedagogical theory as the learning 'processes (personal or public) of coming to know through exploration and conversation across multiple contexts, amongst people and interactive technologies' (Sharples *et al.*, 2009, p. 237). This elucidation reflects the active role of learners in social constructivism and collaborative learning theories.

Social Constructivism

Constructivism is widely acknowledged as one of the most important pedagogical engines in every learner's learning experience. Within a constructivist paradigm, learners take an active role in their learning in that they not only absorb information, but also connect it with their previously assimilated knowledge to construct their new knowledge (Huang, Rauch, & Liaw, 2010). Learning is achieved when learners put forth an effort to learn and not when they are merely spoon-fed information. Johdnson, Johnson, and Smith (1991) agree that knowledge is first constructed, discovered, and transformed by students. Knowledge is constructed for subsequent conceptions, and teachers extend the learner's horizons by acting as a guide for the learner. Constructivism creates capable learners who reproduce a series of facts, and it does not dismiss the active role of the teacher or the value of expert knowledge, contrary to some criticisms. Huang *et al.* (2010) added that constructivists believe in learner-centred education,

in which learners have the freedom to select and coordinate their learning processes with their peers'; this indirectly promotes social and communication skills. To enable learners to experience the learning phases mentioned, it is necessary to employ a collaborative learning approach.

Collaborative Learning

Two learning components mainly associated with collaborative learning are the psychomotor component, which determines what learners do, and the affective component, which describes how learners react to various learning environments. Learning takes place naturally when learners use their psychomotor skills and engage in appropriate action in the learning process. The use of psychomotor skills includes learners sharing ideas, making justifications, working effectively, accepting ideas, and having control over what they want to learn. Meanwhile, the affective component includes the learners' ability to solve issues and lead discussions. These two components shed light on the consequence of collaborative learning and value gained by learners. Collaborative learning was used as early as 1989 by O'Malley and Scanlon (cited in Resta & Laferriere, 2007).

Collaborative learning occurs when students work together in groups to achieve a common academic goal, such as completion of an assignment, worksheet, or project (Glass & Putnam, 1988). Small group discussion and collaborative problem-solving activities also help learners develop critical thinking skills by working collaboratively with others (Romiszowski, 1997).

Learning takes place mostly through interactions among learners, when the learners can pose their own questions, pursue lines of inquiry together, teach each other, and see how others are learning (Stahl, Koschmann, & Suthers, 2006). Panitz (1996) points out that learners are responsible for their own learning and respect the abilities and contributions by their peers when they engage in collaborative learning. Collaborative skills encompass leadership, decision making, trust building, communication, and conflict-management skills. Note that in collaborative learning, teachers teach for the most part indirectly by recognizing learners socially and designing appropriate tasks (Bruffee, 1993).

Framework

Different heuristic tools, for example, Engestrom's (1996) tool-mediated sociocultural activity or Sharples's (2000) conversational framework, may be used to analyze the Mobile Learning system. This preliminary research adopts Koole's (2009) FRAME model to analyze the undergraduates' perception of Mobile Learning (Figure 4.2). The model describes Mobile Learning as a 'process resulting from the convergence of mobile technologies, human learning capacities and social interaction', which accords with this study's definition of Mobile Learning (Koole, 2009, p. 25).

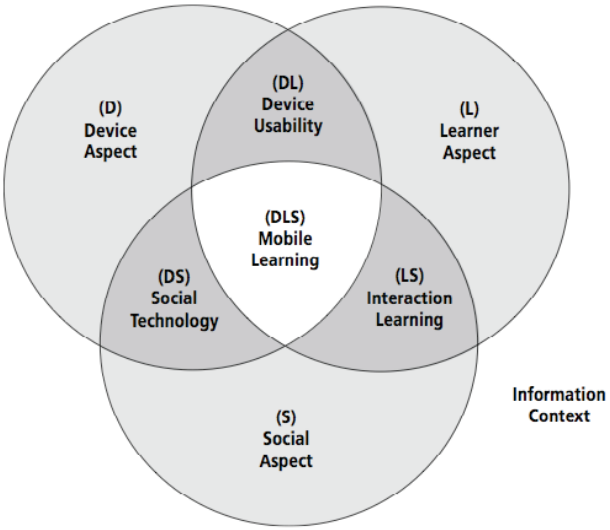

Figure 4.2: Koole's (2009) FRAME model for Mobile Learning

The FRAME model views Mobile Learning experiences as being dependent on context and the interaction between the three aspects of device (D), learner (L), and social interaction (S) (Koole, 2009). Every two aspects intersect with each other to form attributes related to Mobile Learning; the most ideal situation is the intersection of the three aspects to form the attributes that frame Mobile Learning. In this preliminary research, we begin by identifying the undergraduates' mental preparation prior to accepting Mobile Learning (interaction learning; IL) and the devices available to them to support this learning (device usability, DL), as Mobile Learning has not yet been implemented as a learning approach in the higher learning institution.

Importance of Mobile Learning in Malaysia

According to a 2010 report by the Malaysian Communications and Multimedia Commission (MCMC), an estimated 91 percent of Malaysia's population of 27 million subscribe to mobile phone services, compared to 17 percent who have landlines. Malaysia has the second largest mobile penetration in Southeast Asia, behind Singapore. Most Malaysians consider mobile phones a necessity, and this attitude is reflected by learners in the country's higher education institutions. It can be further observed that mobile phone service providers in Malaysia continuously seek to increase their market share by offering highly competitive rates for calls and short text messages or short message service (SMS) in order to encourage customers to switch from one mobile phone operator to another. This competition results from the high number of text messages (10 billion) exchanged by Malaysians in 2006.

It is interesting to note that the Malaysian government expects to see a growth in Mobile Learning content among the nation's many mobile device users. For instance, MCMC

collaborates with one of the country's largest mobile service providers to organize events such as the mobile content challenge and national competition to encourage the creation of innovative mobile content and applications.

In the mid-1990s, several of the country's higher education institutions had already launched programs promoting Mobile Learning on their respective campuses. One of the first to do so in a systematic way was the Open University Malaysia (OUM). OUM has a large student population that is distributed in geographically challenging regions, particularly in Sabah and Sarawak. Thus, the employment of Mobile Learning seems crucial for course content distribution to OUM major stakeholders.

In 2012, a group of academicians led by Prof. Dr. Mohamed Amin Embi established the Mobile Learning Association of Malaysia. The formation of this association also coincided with the first international Mobile Learning conference in Malaysia. This move marks the beginning of a concerted effort to move Mobile Learning to the educational forefront of the nation and to help spearhead collaborative efforts by experts from various institutions in Malaysia to develop Mobile Learning.

Effectiveness of Mobile Learning

According to Shelly *et al.* (2011), Mobile Learning is defined as learning with the use of portable technologies including but not limited to handheld computers, MP3 players, notebooks, and mobile phones. In terms of class management, Mobile Learning can provide support that enhances training in the classroom environment. Mobile Learning, especially text SMS, can be used for distance education students or those whose course requires them to be highly mobile or to communicate logistic information regarding availability of assignment results, venue changes, and class postponement.

Mobile devices are cheaper than personal computers, and for this reason, they are quite popular, especially mobile phones. It has become almost a necessity to own one. Many people have both laptops and smart phones. Given the widespread availability of Wi-Fi, Mobile Learning is highly convenient in that it is accessible from almost anywhere. Mobile Learning, like other forms of e-learning, is also collaborative because the information sharing is almost instantaneous and distributed among everyone using the same content, which leads to the reception of instant feedback and tips (Tremblay, 2010). Mobile Learning also brings strong portability by replacing books and notes with small RAMs filled with tailored learning contents. In addition, it is simple to utilize Mobile Learning for a more effective and entertaining educational experience. It can be concluded that Mobile Learning can significantly complement e-learning by creating additional channels of access for students who use mobile devices such as hand phones, PDAs, and MP3 and MP4 players (Goh & Kinshuk, 2006).

According to Tremblay (2010), with Mobile Learning, learners can access computer-based learning anytime and anywhere, and such flexibility allows knowledge to be disseminated effectively. In fact, the use of mobile technology for Mobile Learning overcomes poor internet connectivity, frequent power disruptions, and low PC support and availability, especially in the remote and rural areas of Sabah and Sarawak in East Malaysia, on the island of Borneo.

According to Wagner (2005), the use of technology alone for learning is insufficient to ensure success in knowledge acquisition. He stresses that learning materials that blend well with features in mobile devices and can make users to understand and acquire knowledge are crucial to successful Mobile Learning.

Methodology

The present study presents and analyzes data from a survey administered to undergraduates at the Universiti Malaysia Sabah in Kota Kinabalu, East Malaysia. The on-campus student population is estimated to be around 10,000. Only Year 2 to Final Year undergraduates were selected to participate. The study sample was chosen randomly from this population. Year 1 students were not included because it was assumed that, having just joined the university system (from the secondary school system), they would not yet be well oriented to adult social networking. A total of 900 questionnaires were distributed randomly to students in various bachelor degree programmes in a few faculties. Of these, 729 questionnaires were returned (response rate of 81.00 percent), and data processing using SPSS for Windows finally accepted 713 valid and complete questionnaires.

The 713 respondents were distributed mainly across four faculties: School of Education and Social Development (245 respondents, 34.40 percent), School of Food Science (135 respondents, 18.90 percent), School of Business and Economics (233 respondents, 32.70 percent), and School of Science and Technology (100 respondents, 14.00 percent). Female learners (563 respondents, 79.00 percent) outnumbered male learners (150 respondents, 21.00 percent). The majority of the learners were 21–25 years old.

The main objectives of the survey were to determine the students' readiness for Mobile Learning, the types of mobile devices they used, and the uses of Mobile Learning. The survey comprised seven items in which respondents rated their agreement with a given statement on a five-point Likert scale. The questions were adopted from the Mobile Learning Readiness Study by Williams (2004). The internal reliability analysis using Cronbach's alpha was .947; therefore, the survey was found to be strongly reliable.

Findings & Discussion

Device Usability (DL) in Koole's FRAME Mobile Learning Framework

As explained, Koole's FRAME Mobile Learning framework for DL stresses the importance of the devices available to support Mobile Learning (Koole, 2009). The survey results indicated that 287 out of 477 respondents (60.2 percent) had either a tablet or smart phone with Wi-Fi access capability. Of these 287 respondents, 48 respondents (10.1 percent) had a tablet such as a Samsung tab or iPad. These figures are considered high compared to the national mobile phone ownership rate of 91% in 2010.

The factors that led to the high ownership rate of smart phones can be attributed to the technical supports of telecommunication providers and the cheap, competitive price of smart

phones on the market. In Malaysia, the most popular mobile service providers for broadband services are Celcom, Digi, and Maxis, which are the wireless broadband internet service providers for the whole country. Cheap smart phones averaging from RM400 (low-end) to RM2100 (high-end) are widely available at hand phone retailers throughout the country. The survey results showed that 487 of the 713 respondents (68.3 percent) were registered with one of the authorized internet service providers, corresponding to an affordable and reliable data plan for internet access. The breakdown of percentages for internet service providers is as follows: Celcom (21.60 percent), Digi (23.70 percent), and Maxis (24.90 percent).

These findings with regard to the high DL fulfil part of the *paraphernalia* component of the theory of Mobile Learning proposed by Sharples *et al.* (2009), which clearly indicated that to enable effective Mobile Learning, current learning apps should be made widely available on an android or iOS platform. It can be concluded that only a smart phone or tablet can deliver Mobile Learning that can interact with the *participants* and *place* components in Sharples *et al*.'s (2009) theory of Mobile Learning.

Without using suitable apps on the smart phone, many university courses, particularly English as a second language courses and business-related courses, that use the e-learning approach face difficulty switching to mobile mode. Examples of e-content to be delivered through Mobile Learning are e-books (via e-book apps), Moodle-based activities via the Learning Management System, such as forums and quizzes (via mobile internet apps), e-content in a document or pdf format (via document viewer apps), and social networking activities to facilitate learning (via FB apps).

Interaction Learning (IL) in Koole's FRAME Mobile Learning Framework

Koole's FRAME Mobile Learning framework on IL highlights the importance of the undergraduates' mental preparation in their acceptance of Mobile Learning. To examine their mental preparation, data on the perception of Mobile Learning was elucidated via the survey. The results of the survey are shown in Table 4.2.

Table 4.2: Perceptions of Mobile Learning (N = 713)

No.	Item	Frequency (3, 4, and 5)	Percent	Mean	SD
1	Mobile Learning helps me to manage my learning time better.	615	86.26	3.22	.95
2	Mobile Learning motivates me to learn (Example: learn in multimedia mode).	604	84.71	3.28	.99
3	Mobile Learning attracts my attention in learning.	612	85.83	3.42	1.02
4	Mobile Learning provides flexible learning time for me.	615	86.26	3.50	1.04
5	Mobile Learning helps me to complete my assignments faster.	602	84.43	3.35	1.02
6	Mobile Learning can improve my productivity.	613	85.97	3.40	.98
7	Mobile Learning helps me greatly in the course I am taking.	621	87.10	3.40	.97

The overall findings of the survey indicated that the students generally viewed Mobile Learning as beneficial and useful. The overall mean for the seven items in the survey was 3.37, with a variance of .008. This indicated a satisfactory level of perception of the use of mobile devices in learning. In terms of time management (Item 1), the respondents held the opinion that Mobile Learning will better assist them in managing their time (86.26 percent) as well as paying much more attention to learning (Item 3) (85.83 percent). This was because Mobile Learning provides great flexibility for students to manage their learning time (86.26 percent) (Item 4).

Furthermore, 604 of the 713 respondents (84.71 percent) agreed that Mobile Learning motivates (43.15 percent) their learning (Item 2). Mobile Learning was also found to be able to improve learners' productivity (85.97 percent) (Item 6), as many learners agreed with the statement that Mobile Learning helped them to complete assignments faster (84.43 percent) (Item 5). This increased productivity could be due to the ease of retrieving extra information through links given by course lecturers or through the help of online search engines such as Google. Many respondents agreed that Mobile Learning was indeed helpful to their learning in the current course (87.10) (Item 7).

The overall findings of the survey indicated that the level of the university's IL (Koole's FRAME framework) was at an acceptable level. The means for the seven items were all above 3.00, which indicated the students' positive acceptance of Mobile Learning and fulfils the *participants* and *place* components of Sharples *et al.*'s (2009) theory of Mobile Learning.

The *participants* component requires exploratory communication using mobile devices to enable social constructivist and collaborative learning. Below is an excerpt from an interview with one generation-Y student:

> *I use my smart phone to do social networking via FB with my course mates. Lots of learning materials can be exchanged with my friends from Peninsular Malaysia. Assignments from my lecturer I mostly do online, and I check and recheck them with my study group. This way, I can complete my assignments faster. I think doing work collaboratively is really cool and motivating. I love it.*

The interview data showed that Mobile Learning facilitated the student's learning to enable her to work quickly and more productively. The *place* component helps to form a distributed system of meaning making that promotes collaborative knowledge building via Mobile Learning. As explained by the student, Mobile Learning helped her to keep in touch with friends in distant places, and the discussions on learning that occurred made her learning meaningful.

The *place* component was also supported by other findings in the survey. For example, many respondents agreed that they need a way to access lecture notes (57.9%), participate in learning activities (73.8%), search data and information online (91.0%), and engage in social networking with their classmates (82.0%) using a mobile device. The fulfilment of the three components (*paraphernalia, participants and place*) in Sharples *et al.*'s (2009) Mobile Learning theory, as indicated in the study, fits well into Koole's FRAME Mobile Learning framework on DL and IL. This shows that the university has a satisfactory level of student readiness for a larger scale implementation of Mobile Learning.

Conclusion

Recent advancements in technology have brought positive changes to the selection of a preferred path for learning in higher education. Given technological innovations and the affordability of mobile devices, students are able to learn successfully through Mobile Learning. The finding that 60.2 percent of the survey respondents owned at least a smart phone or tablet demonstrates that the university is ready for a larger scale implementation of Mobile Learning. With support from the top three largest mobile service providers, broadband internet access is no longer a major barrier to Mobile Learning implementation. Learners have indicated their readiness for Mobile Learning (mean = 3.37), and the study findings are well supported by Koole's FRAME Mobile Learning framework; thus, Mobile Learning in the university is recommended as a worthy investment.

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{ Chapter Five }

The Influence of Demographics on Mobile Learning Readiness: Science versus Social Science Undergraduates

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Introduction

In Malaysia, the reception of Mobile Learning, based on the results of several studies, is seen as encouraging (Hashim, Wan Fatimah & Rohiza, 2010; Ismail, Gunasegaran, Koh & Idrus, 2010; Issack, Mussawir & Ramsawok, 2006; Jacob & Isaac, 2008; Naji Shukri & Abdul Razak, 2011; Norazah, Mohamed Amin, Ruhizan, Saemah & Melor, 2010; Zoraini Wati, Norziati & Ghang, 2009). These wide-ranging studies explore the elements of perceptions, readiness, and satisfaction level toward Mobile Learning; their results portend promising outcomes and positive acceptance from targeted users. The studies were conducted at various Malaysian higher-education institutions (HEIs), namely, Universiti Malaysia Sarawak (UMS), the Open University of Malaysia (OUM), Universiti Sains Malaysia (USM), Universiti Kebangsaan Malaysia (UKM), Universiti Teknologi Petronas (UTP), and Universiti Utara Malaysia (UUM).

A study at USM, in particular, indicated a high level of user satisfaction and confidence regarding the advantages of Mobile Learning in keeping pace with their studies, especially in distance-learning courses (Ismail, Gunasegaran, Koh & Idrus, 2010). In the case of UTP, most of the respondents who owned and used mobile tools expressed a high level of confidence in Mobile Learning and believed that the utilisation of Mobile Learning could feasibly increase the effectiveness of current learning practises (Hashim, Wan Fatimah & Rohiza, 2010).

Such promising empirical evidence, demonstrating inclusive development in Mobile Learning among Malaysian HEIs, has contributed to statistics and to probable explanations for the results of the 'Ambient insight comprehensive report: The worldwide market for Mobile Learning products and services: 2010-2015 forecast'. In this report, Malaysia was reported as having the 9th highest Mobile Learning five-year growth rates worldwide. In fact, Malaysia

is designated within 'Category 1': it is characterised as having a mature market for mobile technology, exhibiting high market penetration of mobile phones, and possessing a strong information and communication technology (ICT) infrastucture that enables Mobile Learning within a broad context of national-level ICT policies, including those involving Mobile Learning. Malaysia shares this distinction with countries such as Singapore and South Korea (UNESCO, 2012).

Our exploration leads to queries on the aspects of readiness or factors that influence Mobile Learning acceptance among Malaysian HEIs; this questioning is a necessary effort in the quest to gain a deeper understanding of the factors that motivate users to accept online learning (Teo, 2010). Whereas research on Mobile Learning Readiness (MLR) has extensively and noticeably generated interest among language researchers during the past ten years, our knowledge of the reception of Malaysian university students towards language learning via Mobile Learning remains limited. There is particularly little information in the literature identifying demographic determinants or constructs that affect students' intentions to use Mobile Learning, such as differences between and among genders, ethnicities, and socio-economic status (SES). This exploratory study has developed and validated a framework of mobile-technology-based language learning for Malaysian students. To that end, in discovering determinants or constructs that may influence the development of the framework, this study specifically attempts to compare MLR between respondents from two HEIs (hereafter referred to as HEI A and HEI B). The difference between the groups from the two HEIs is that respondents enrolled in HEI A possess a background in science (namely, engineering), whereas HEI B respondents have undergone a course of study in social science (namely, religious studies).

The primary aim of the study is to determine the influence of educational background, particularly at the secondary level, on the MLR of undergraduate students in a science versus a social-science knowledge discipline. To operationalise this study, four research questions have been devised, in accordance with the four sections asked in an instrument reported by Supyan Hussin *et al.* (2011). The research questions were devised to find out whether a significant difference exists between the MLR of HEI A and HEI B respondents in terms of:

1. basic physical readiness
2. skill readiness
3. psychological readiness
4. mobile language-learning readiness (MLLR)

This study attemps to contribute to the fundamental knowledge of Mobile Learning in the context of Malaysian HEIs. The review of related literature that follows illustrates the need for a specialised or specific approach to tackling the needs of learners with diverse educational backgrounds such that they will accept and undertake Mobile Learning.

Literature Review

The Influence of Educational Background on Mobile Learning

A study by Sammons, Thomas and Mortimore (1995) indicates the effect of demographic factors, such as SES, ethnicity, school environment, and peer influence, in affecting classroom achievement; learning, motivation, and progress. As such, it is possible to measure the difference made by that school environments (Scott 2008). In this conception, the influence and variance in students' outcomes can be explained by school and classroom factors when the background of students is taken into consideration (Cremmers, 2008). Findings from several studies also suggest that academic and social/affective outcomes such as attendance, attitude, and behaviour are determined by the school environment. Findings show that students had a more positive attitude towards schooling and interactions in a more effective school, compared with the less effective one (Sammons, Thomas & Mortimore, 1995).

In supporting the stance of Howland and Moore (2002) of there being 'no one-size-fits-all' approach to online learning, it is important to acknowledge that some learners require more training than others; some bring previous experience with online courses and others come having little or no experience in this area. Therefore, it is plausible that this investigation into the influence of the education background of students to their acceptance of or readiness to use technology in education, specifically, offers significant awareness to educators on how to implement the four aspects of the Mobile Learning implementation approach.

MLR as Needs Analysis (NA) for Mobile Learning Implementation

Brown (1995) outlines needs analysis (NA) or need assessment as a methodical compilation of learners' necessary language-learning requirements that influence learning and teaching in a particular context or situation. He considers this technique to play a central role in designing a communicative language course (Munby, 1978; Flowerdew, 1995). Jasso-Aguilar (1999) asserts that NA involved surveying learners to determine their backgrounds and goals, linguistic and behavioural demands, and preferred learning and teaching strategies. Eslami (2010) asserts that learners from different disciplines have different perceptions of language-learning needs and problems; these are among the many factors that language educators should take into account when designing English for Academic Purposes (EAP) courses. These educators should particularly use technology- and student-centred approaches to teaching. Meanwhile, a more recent research report by Evans and Morrison (2011) emphasised the need to analyse students' experience of studying in English before admission to higher-education institutions that use English as the common language in which classes are taught. The concerns of the NA are with learners' readiness to gain academic-discipline knowledge, particularly among students who lack the requisite training and proficiency to study effectively in English. As such, a study on MLR can consider the technique to be at the NA stage before educators embark on the comprehensive stage of implementing an MLR program. We assert this because examination of

MLR involves inspection of elements related to learners' needs, wants, and lacks (Fatihi, 2003) in using mobile technology as part of a language-learning course.

Socio-cultural Learning Theory

Socio-cultural learning theory is largely based on the social development theory (SDT) of Vygotsky (1978), which hypothesises that learning occurs first through interpersonal means (i.e. interaction with social environment) rather than intrapersonal ones (i.e. internalisation) (Vygotsky, 1978). A process of co-construction between the experts and the novices, in second-language learning, for instance, takes place; this process scaffolds the learning process. Vygotsky argues that consciousness and cognition are the end products of socialisation and social behaviour. His theory asserts the following major themes:

1. Social learning precedes development, and social interactions plays a fundamental role in the process of cognitive development.
2. The more-knowledgeable other (MKO) is a concept that refers to anyone or anything that has greater ability than the learner, including teachers, peers, or even a computer.
3. The distance between learners' ability to perform a task under guidance (i.e. dependence) and their ability to solve the problem independently occur in the learners' zone of proximal development (ZPD).

Vygotsky believes that humans mediate their social environments using tools such as speech and writing. He posits that the internalisation of these tools, which develops out of their sole use in serving social functions and ways to communicate needs during childhood, leads to higher-thinking skills.

SDT is also the foundation of constructivism. Applying this theory in online teaching means that an educator must move from the traditional context of being the sole information provider to a context that promotes an active role for students in learning. Educators need to collaborate with their students in assisting construction of meaning in students as they learn. Information about the students' experiences and social backgrounds at this stage can help educators to improve the extent or type of activities required to optimise learning.

Language-Learning Acquisition

The Monitor theory put forth by Krashen (1981) theorises that subconscious language acquisition and conscious language learning are independent systems that exist in adult learners of a second language. Language acquisition occurs in a manner similar to the way children acquire their first and second languages: conscious awareness of the rules of the languages is gained through conscious, formal learning of those rules. Although these two systems are interrelated, Krashen emphasises subconscious language acquisition as being more important than conscious language learning because the latter acts as a type of monitor that alters the output, based on the information the individual has already acquired. Hence, the language output or language performance is initiated by the acquired language system of an individual.

Discussions in the literature about language acquisition and language learning compose a solid foundation to approaches in second-language teaching. Pedagogical approaches need to accommodate the abilities of various individuals: some students learn a new language faster than others. Differences may also occur due to age, personality, intrinsic motivation, experiences, cognition, and native-language factors. Other external factors, such as extrinsic motivation, curriculum, instruction, culture, and even opportunity to practice, must also be considered. Dealing specifically with adult learners includes more aspects, such as schooling, that depend on the social environment to which the learners are exposed. Additionally, apart from motivating these learners, supporting their learning processes may help to expedite their acquisition of the experience that they might have not gained previously.

Methodology

Design

We present a case study using online self-report. The data was collected from respondents to an online survey conducted via Google Docs. We requested and were given consent for official access and permissions from lecturers during designated times.

Instrument

We used the MLR instrument designed by Supyan Hussin *et al.* (2011). It measures four domains of readiness, namely, basic physical readiness, skill readiness, psychological readiness, and MLLR, with 45 total items addressing these domains (α= .755). The instrument has been utilised in a related study by Supyan Hussin *et al.* (2011); the findings will be discussed and reflected on in the latter part of this study.

Sample

A total of 69 undergraduate respondents (HEI A, n = 36; HEI B, n = 33) participated in our study. The respondents selected were students who had newly enrolled in the university.

The respondents were differentiated by their educational backgrounds. As a prerequisiste for inclusion in the study group, respondents from HEI A needed to have undergone a matriculation program and to have obtained at least two academic credits in scientific subjects (i.e. physics, chemistry, or biology), all of which were needed to enroll in engineering programmes at their institution. By contrast, HEI B respondents were from a religious-studies background and had undergone *Sijil Tinggi Agama Malaysia* (STAM) or *Sijil Pelajaran Malaysia* (SPM) or *Tamhidi* (HEI B matriculation) with an emphasis on Arabic-language acquisition and at least two religion-related subjects, all of which were prerequisites to university enrollment. The respondents were selected through their respective lecturers, regardless of gender and other demographic factors. The main criterion of selection is the respondents' background of secondary education

in religious studies (which represents the social-science field) or engineering (which represents the field of science).

Data Analysis

The objective of this study is to investigate the influence of demographics, particularly secondary-school educational background, on MLR. Hence, we performed an independent-sample *t* test, using SPSS software, version 18 to analyse the data gathered from the instrument.

Results

Basic Physical Readiness

In comparing aspects of basic physical readiness between respondents in the HEI A and HEI B groups, a significant difference was observed. The *t* value was determined to be-3.074; standard deviation [SD] was determined to be .04382 (*P* = .003).

Skill Readiness

In comparing aspects of skill readiness between the HEI A and HEI B groups, the *t* value was determined to be 3.283; the SD was determined to be .22591 (*P* = .002). Evidently, there is a significant difference in terms of skill readiness between the HEIs involved in this study.

Psychological Readiness

In terms of psychological readiness, no significant difference was observed between respondents from the two groups (*P* = .805). The t value was determined to be .25 (SD = .07385).

MLLR

In terms of MLLR between the HEI A and HEI B groups, no significant difference was observed (*P* = .12). The *t* value was determined to be 1.557 (SD = .11770).

Discussion

RQ 1: Is there a significant difference between HEI A and HEI B in terms of basic physical readiness?

Based on the findings, there is clearly a significant difference (*P* = .003) between religious and science backgrounds: the respondents with a science background show greater basic physical readiness for Mobile Learning. The domain BPR focuses on mobile-telephone properties,

particularly 3G accessibility and smart phone capability, which can run and open numerous types of files on the phone.

These results were as we had expected, namely, that respondents with a science background were more eager to explore new mobile technology, due to the investigatory nature of the field of science and the advancement of knowledge consistently sought in that field. The influence of peers, teachers, and surrounding was probably instrumental to the results we observed in this group. Respondents from a social-science background may have had the ability to acquire mobile phones with the capabilities stated earlier herein but few of those individuals may have chosen to acquire such equipment. Most probably, the features of such equipment may not have been seen as necessary by respondents with a social-science background, or by individuals in their circle of influence.

RQ 2: Is there a significant difference between HEI A and HEI B in terms of skill readiness?

As is evident in our findings, there is a significant difference between respondents from social-science and science backgrounds ($P = .002$) in terms of skill readiness; again, the latter superseded the former in this domain. Skill readiness refers to the ability of respondents to make full use of mobile devices (such as smartphones) to access the Internet and reading materials, as well as to send and receive files remotely via handheld devices.

Logically, when one has access to equipment such as handheld devices and smartphones, one can more fully explore the capabilities of those devices. For that reason, in the context of this study, the respondents with a science background have a strong advantage compared with their counterparts with a social-science background.

RQ 3: Is there a significant difference between HEI A and HEI B in terms of psychological readiness?

No significant difference was observed between the two groups in terms of Psychological Readiness ($P = .805$). The psychological readiness domain refers to understanding, wanting to know about, and accepting the idea of integration of learning and the use of handheld devices or a wireless environment (i.e. e-learning and Mobile Learning).

It is therefore feasible to deduce that Malaysian students at a tertiary level of education, particularly those who took part in this study, are aware of and have already accepted the surge of technology and innovation in teaching and learning. This finding corresponds with those of an earlier study by Supyan Hussin et al (2011).

RQ 4: Is there a significant difference between HEI A and HEI B in terms of MLLR?

No significant difference was observed between the two disciplines ($P = .12$) regarding MLLR. The MLLR domain refers to the perception of respondents regarding the implementation of and the learning of languages through mobile devices.

Concerning this aspect, regardless of their secondary-school background, students are ready for and have accepted the new technology and innovation in teaching and learning at the tertiary level of education.

Conclusion

The aspect of educational background, which we have highlighted in this study, has proven to influence learners' levels of readiness to undertake Mobile Learning. Like other demographic aspects such as age, gender, or even SES, educational background is an important variable to be considered by researchers conducting future studies on Mobile Learning or on learning that involves the use of any type of technology.

In the context of this study, data on the respondents' Mobile Learning Readiness provides two interesting outcomes. Particularly regarding the significant differences of basic physical and skill readiness towards Mobile Learning between students majoring in science and those majoring in social science, the culture of the science field has encouraged its students not only to accept technology more readily but has also called for higher awareness of the need to be technologically competent for the purposes of e-learning. The field of science also emphasises the pertinence of technology and establishes workplace-competence requirements for the fluent use of technological tools. However, an in-depth investigation is merited to further validate this demographic factor as a significant construct in developing a framework for Malaysian Mobile Learning. A longitudinal study can provide better understanding regarding the influence of this factor on learners' technological readiness and acceptance; results of this type of study can be used to influence pedagogical deliberations.

Our findings reveal that inspecting learners' readiness to undertake Mobile Learning is a vital effort that is necessary before comprehensive implementation of an Mobile Learning, as part of its NA process (Howland & Moore, 2002; Fatihi, 2003; Eslami, 2010; Evans & Morrison, 2011; Liu, Chang, Yang & Sun, 2011). This effort should occur because the results of inquiry into learners' readiness are likely to become indicators of the success of pedagogical approaches, types of activities, or even selections of educational materials; some or all of these approaches may be required to optimise the learning ability of students with various educational backgrounds and language-learning processes. In other words, our results point to the need for different types of or approaches to mobile language learning for students with different educational backgrounds and students studying different knowledge disciplines. Additionally, different Mobile Learning applications that are directly related to their interests can be useful in motivating students to use technology as part of the learning process. Technological competence and the advancement of technological adaptations are more likely to occur in a particular field of study when the available e-tools are immediately applicable to that field.

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{ Chapter Six }

Student Perceptions of a Mobile Learning Environment through Mobile Technology Applications

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Introduction

> *"SMS has been called the 'killer' application of mobile phones, as its usage exceeds all expectations." (Markett et al. 2006, p. 282)*

The above statement by Markett *et al.* (2006) supports findings by a few studies that reported that 80% of students send Short Message Service (SMS) texts every day (Markett *et al.* 2006; Hortsmanshop, 2004). Globalization has opened up more opportunities for educationists to design and implement lessons based on information and communication technology (ICT). Given that today's students in the Net Generation are not afraid of technology use, teachers should make full use of available technologies, particularly students' own mobile devices, to make learning more meaningful and interesting. No single method or tool can be claimed as the best solution to solve the current problems in education. Learning does not take place in a vacuum; characteristics of learners, teachers, tools, and activities will always have to be considered to make learning a meaningful process. The traditional method of delivering information to students usually exists in a formal setting, namely, the classroom. Teachers use textbooks, blackboards, chalk, and printed materials to give lesson information. Currently, however, traditional methods are being replaced by newer alternatives (Murray, 2005). Teaching aids or materials provide opportunities for interaction between teacher and learners; they also affect the quality of interaction and have an effect on language learning (Murray, 2005). The use of ICT is only one of the new and enhancements to make learning and teaching more appealing (Kenning, 2007; Mohd Arif, 2004; Tinio, 2002).

Researchers have conducted surveys to identify the use of technology among teenagers and younger students. Teachers know that most of their students own at least one cell phone or other mobile technology device, such as an MP3 player, laptop, or game console. Most of the time, they use these devices for socializing or entertainment (Ally, 2009). The question is whether students and teachers are ready to explore the new potential of using mobile technologies for learning. Rashidah *et al.*'s (2011) survey of 235 students found that the majority were ready to

use mobile technologies for learning purposes, as judged by the fact that they owned mobile phones and were able to carry out specific tasks using the technologies. This study channels the assumptions that students are prepared for the use of ICT in learning because of their familiarity with the technology and economic means to purchase appropriate devices. Given the students' readiness, teachers should be encouraged to blend the use of ICT into their conventional teaching methods. This not only helps teachers to create a new learning environment but also encourages lifelong learning.

This paper reports the findings of a study on student perceptions of receiving an SMS message from their teacher. The study aims to answer the following questions: (1) What are students' perceptions regarding receiving SMS messages? and (2) How does SMS use affect their learning?

Literature Review

Mobile Learning

The terms Mobile Learning and mobile technologies trigger some confusion regarding their specific definitions. The phrase "Mobile Learning," or m-Learning, is commonly associated with the use of mobile technology, particularly mobile phones (Cavus *et al*., 2008; Naismith *et al*., 2004). "Mobile" generally refers to something that is portable and personal; some scholars classify portable technologies, such as cell phones, handheld computers, or any devices that can be carried in one's pocket, as most suitable for m-Learning definitions (Naismith *et al*., 2004). Mobile Learning is considered as wireless learning; it is a subset of e-learning, which more generally includes learning by using personal computers (e.g., desktop computers) with internet access. Mobile Learning more specifically refers to learning through internet access using portable devices such as mobile phones or game consoles (Alexander, 2004). Therefore, the integration of Mobile Learning in school curricula is an alternative to help increase student interest and motivation in the lesson**.** However, the concept of Mobile Learning also takes into account students' location, which is not static and does not depend on the mobile technologies they own (Aderinoye *et al*., 2007; Kukulska-Hulme, 2009; Traxler, 2007; Woodwill, 2010).

Mobile Technologies

Mobile technologies are usually associated with portable devices, which can be used in learning as the following: (1) intelligent tutor system, (2) simulators and learning tools as well as a pedagogy agent, (3) system device and resources, (4) communication device, and (5) simulation classrooms (Sharples, 2001). In addition, according to Naismith *et al.* (2004), there are two dimensions of mobile technologies: (1) personal and shared and (2) portable and static. Naismith *et al.* also point out that there are six learning theories related to the use of mobile technologies: behaviorism, constructivism, situated, collaboration, informal learning and lifelong learning, and support in teaching and learning. Today's generation of students live in a world dominated by high tech devices, and they are eager to access information through

technology. This use of technology enables them to engage in global networking (Mohd Ariff & Rosnaini, 2003; Roziah, 2004).

ICT is a medium for students to access knowledge. The term "e-learning" was coined to describe students' use of electronic technology, particularly computers, to access information online. According to Cavus and Uzunboyle (2009), e-learning has evolved towards the use of mobile technology to access and improve the quality of education. In today's era, the internet is accessed from not only desktop computers but also mobile technologies such as mobile phones or laptops. It has been reported that 11.5% of students aged 15 to 19 years old own cell phones in Malaysia. In addition, Thornton and Hauser (2005) found that in Japan, more cell phones than PCs are owned.

Associations of Mobile Technology Use in the Net Generation

The Third Generation (3G) is said to have started around 2003/2004. It was estimated that about 2 billion people worldwide were using mobile phones and about 680 million mobile phones were sold in 2005 (Anderson *et al.*, 2006). Additionally, one out of every six people in the world owned a mobile phone, Personal Digital Assistant (PDA), and laptop with Wireless Fidelity (Wi-Fi) (Economides & Grousopoulou, 2009). Most teenagers treat cell phones as a fashion accessory or tool for their social activities, regardless of their location (Economides & Grousopoulou, 2009; Naismith & Smith, 2009). Teenagers aged 13 to 17 can be considered as millennial students who were born in the 1990s, when technology was booming and becoming a part of daily life (Rocca, 2009). McAlister (2009) writes that millennial students are comfortable and confident in dealing with computers and would be delighted with the "multi-sensory engagement" related to a variety of media used in their learning. She further explains that "Using these new tools in combination with our sound pedagogical knowledge will lead to well-grounded, engaged students who will continue to explore the world... beyond their lesson years" (McAlister 2009, p. 13–15).

Thornton and Houser (2005) highlighted that "71% of the students in Japan liked receiving lessons on their mobile phones better than PCs; 93% found mobile phones to be valuable for teaching; and 89% wanted to continue using their mobile phone for educational purposes." These findings indicate that today's generation prefers the use of technologies to the conventional method of delivering lessons (i.e., through chalk and talk).

Methodology

To achieve the objective of this study, the data were collected through informal interview sessions with 26 participants. The participants were interviewed after they had finished five sessions using a web-based learning package known as e-Lit (electronic literature package), with the researcher acting as the instructor. The instrument used in this study was a set of interview questions adapted from previous studies (Che Ton Mahmud, 2005; Yesuiah, 2003) as well as created by the researcher. The interviews were recorded using a SONY voice recorder.

The data were transcribed, and emergent themes were abstracted. The findings are discussed and presented descriptively.

Participants

A total of 26 participants were interviewed, 4 boys and 22 girls. All were 16-year-old Form Four students studying at five secondary schools in the district of Seremban, Negeri Sembilan, Malaysia. The participants were selected by their English language teachers. The interviews were conducted in the computer lab of each school immediately after the last session or the following day. Table 6.1 shows the number of classes and participants in the study.

Table 6.1: No. of schools, classes, and participants

School	No. of classes involved	No. of participants	No. of participants present
A	3	9	7
B	2	6	5
C	2	6	5
D	3	9	6
E	2	6	3
Total	12	36	26

The students were sent an SMS message reminding them to surf a website that had been prepared for the English Language Literature Components class. Each student previously had been asked to provide his or her contact number. This was done immediately after the first meeting, and the students were not informed of the purpose of providing their contact number. Figure 6.1 shows the concept applied in the study.

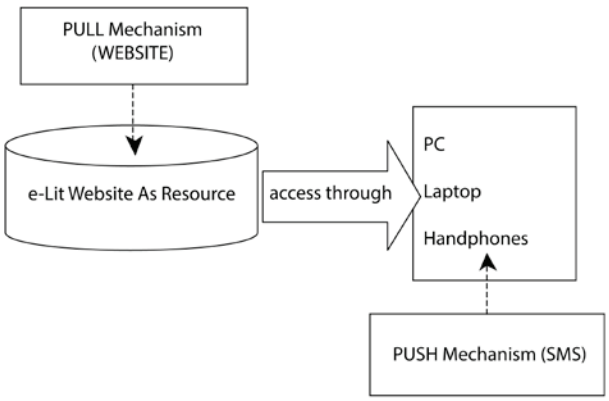

Figure 6.1 The Mobile Learning applications of the study on the mobile learning framework by Motiwalla (2007).

Study Procedure

The participants were introduced to e-Lit, a web-based resource developed for learning Literature Components of English for Form Four. The students were required to fill in their demographic information, including their mobile phone number. They were assured that the numbers would not be distributed to others; all information would be kept confidential and used only for research purposes. The participants were not required to reply or send SMS messages to the teacher (i.e., the researcher). However, they could reply or send messages if they wanted to. The SMS messages acted only as a reminder for them to access to the website after school hours and to alert them to new activity on the online discussion forum. The discussions focused only on the poems and short stories the students were learning in school. The SMS messages were sent twice: after the first session and in the fourth session. Figure 1 displays the overall design concept of creating the Mobile Learning environment in this study.

Findings

The interview data revealed significant findings. The SMS messages had a positive impact on student motivation and interest regarding participating in the study. The findings are presented based on questions posed earlier as well as on themes extracted from the interviews.

a) What are the students' perceptions of the SMS messages they received?

The results of analysis indicate students had a positive perception of receiving SMS messages from their teacher. A majority gave positive feedback to the question of how they felt when they first received an SMS message from the teacher. Out of the 26 respondents, 24 said they were shocked but happy and felt motivated. Table 6.2 lists some of the participants' remarks about their feelings and views towards the SMS messages.

Table 6.2: views on SMS messages received

Participant	Excerpt
R2	Shocked… That was the first SMS message from a teacher… I felt appreciated.
R12	At first, I was shocked. What is this number? 06… Isn't this a house number?... Ok... I wanted to reply to say "thank you," but when I thought, "That is a residential number"…Eh! No need…It might not reach the person.
R13	I didn't expect it. You said that we were going to get a message, but sometimes they will not send any… You are encouraging us.
R14	Shocked… It is very rare for a teacher to send a message to students.
R19	At the beginning, I was shocked…Eh! Whose number is this? After I read it… Ooooh, the teacher!... This is not going to be just for one day right, teacher? Some people, if they want to promote something, they only make promises at the beginning, but…when teachers send SMS messages, it shows they really want to teach us about literature…I really appreciate it.
R20	Shocked…
R21	I was quite shocked… Ok… It can give us more motivation to continue this online.

The respondents also mentioned that the SMS messages they received made them happy and motivated to participate as well as to surf the related website. For example, one participant said, "*Wow! Happy! Because… it is not easy for a teacher to send a message to his/her students.*" Another reported that she felt motivated by receiving the SMS: "*I feel motivated to open the SMS…because there's someone giving us encouragement."*

b) How does SMS use affect the students' study?

To gain information for the second objective, the participants were their opinions on the issue of their teacher sending them SMS messages. All 26 participants indicated that it would be a good move, since the act would have a positive impact on their emotions. Some mentioned that the SMS messages from their teacher would make them feel excited (n = 14), motivated (n = 9), and more interested in studying (n = 1). Only two participants reported that they felt neutral about the SMS messages. For example, one respondent said receiving an SMS message would be exciting "*because it is the teacher who sent it… [I] feel excited when someone is concerned about us*." Another participant gave a detailed response, shown below:

> *"Because before this, no teacher sent [SMS messages]… For example, after class is finished, …sometimes the teacher just says, "Good luck." Yes, that is also giving us encouragement…It comes verbally from the mouth…but if it is from a message like this, oooh…This teacher knows us because she even knows our phone number…So, it makes me even more motivated to come to school!"*

This student's interview revealed that students can receive positive motivation when teachers pay attention to the emotions behind their learning. Words of encouragement expressed verbally, as well as those sent through SMS, can motivate them to learn. Table 6.3 presents excerpts demonstrating this finding.

Table 6.3: views on SMS messages for learning

Respondent	Excerpt
R7	I become more attracted to study
R9	… I feel flattered… because someone is thinking about us.
R21	It can give us motivation to continue using the website.
R22	I feel motivated.
R24	I feel motivated to go to school tomorrow… to search for something more interesting.
R26	Thank you, if the teacher sends an SMS message!

Discussion

This study has explored the use of SMS, and the findings are similar to those of previous studies using the same method (Santos, 2010; Thornton & Hauser, 2005). Even if the use of cell phones

in Malaysian lower and secondary educational contexts is still a subject of debate, teachers and educators need not be too rigid in providing a conducive, new learning environment for their students. Knowing that today's generation has grown up around technology devices, teachers should be encouraged creatively challenge their students to become more interested in learning the subject matter. In the context of teaching and learning the literature components of English, many second language learners experience decreased interest because poems can be difficult to understand, the texts are long, and students often lack appropriate English vocabulary (Siti Norliana, 2008; Chew, 2006;Gurnam Kaur, 2003; Shameem & Jasvir, 2004; Rosli, 1995). Therefore, it is time for teachers to integrate the use of technologies that students are already familiar with, such as computers and other mobile gadgets, into teaching and learning. SMS is one of the aspects of mobile technologies that has been found to be useful and have a significant positive impact on the students' affective domain.

The use of SMS has been shown to not only increase student motivation but also positively influence other factors as well, such interaction and students' excitement to collaborate with others (Shih & Mills, 2007). This is also the case in this study, as a majority of the students interviewed mentioned that they became motivated and more interested in coming to class after they received the SMS message from the researcher. Feelings of being accepted and appreciated by the teacher seemed to be one of the main causes. Thus, teachers should change their teaching paradigm. Too often, they focus entirely on the cognitive domain—that is., encouraging students to grasp the lesson concepts and score high marks on tests or exams—and neglect the affective part in their teaching practice. Based on the findings of this study, the need to be accepted and noticed by the teacher is one of the main factors influencing student motivation and interest to participate in the lesson.

This study provides some practical insights into the use of mobile phones in the Malaysian educational context. The mobility of students who own mobile technologies could be integrated into the implementation of Mobile Learning. Mobile Learning should not always be associated with the use of mobile technologies. Flexibility in the implementation is necessary to make or create a successful Mobile Learning environment. Thus, it is necessary to carefully plan out the implementation, including considering the cost of SMS as well as the level of access, which is flexible for all types of technologies. Further, the design of learning materials should be focused on. Even so, well-designed teaching and learning materials are not useful if the design of the approach to make the users use it is not good as well. Therefore, teachers need to be creative in designing the lesson to be inviting and interesting.

In addition, the findings of this study are beneficial for teachers, as they provide insights into making full use of the technologies owned and used by students as learning tools. By incorporating technology into their teaching practices, teachers can demonstrate that they are not afraid of technology use (Zainal Abidin, 1999). In contemporary education, the integration of ICT cannot be separated from good teaching (Pierson, 2001). It not only reflects good teaching practice but also shows how confident and interested teachers are in using ICT for educational purposes; it also shows that the teachers have up-to-date skills in the ICT era (Rodrigues, 2006).

Effectiveness and success in educational organization is determined by people who are instruments of change (Nunan & Wong, 2005). If teachers are not willing to change, change will not occur; lessons will continue to be taught using the basic "chalk and talk" processes (Rashidah *et al*., 2011). Yet, advancements in technology will inevitably affect teachers' work;

even so, teachers need not put aside the humanistic elements in their process of imparting knowledge in and outside the classroom boundaries.

Conclusion

Based on the study, it can indeed be said that "*SMS is a killer application*" (Markett *et al.*, 2006). Given its potential to increase student motivation and interest in learning, SMS should be creatively used by educators at all levels of education. Exploration on how to make learning both interesting and meaningful by integrating technology into teaching practices requires careful planning. Teachers must adapt learning materials to suit their students' needs as well as foster an environment that supports learning. Therefore, it is worthwhile to consider that in learning, new technologies are just the tools; what is most important is how we use them (Richards, 2001).

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Chapter Seven

Mobile Learning: A Quasi-Experiment on Using SMS to Support Reading Comprehension Programme

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Introduction

Studies have shown that the ability to read and comprehend is closely correlated to students' academic performance and achievement (Bishop, 2003; Lei, Rhinehart, Howard & Cho, 2010; Brown, 2007; White, 2004). Research on reading reflects that an effective learning approach or method leads to the development of good reading skills (Brantmeier, 2005). The literature has shown the potential of including extensive reading into reading instruction as part of an attempt to develop students' language and reading comprehension skills. Studies on extensive reading indicate that students found the activity worthwhile (Macalister, 2008; Tanaka & Stapleton, 2007).

Extensive reading (ER) is defined as reading "materials in the target language in a rapid and casual way with a focus on quantity rather than quality" (Tanaka & Stapleton, 2007, p. 115). Extensive reading involves reading a large number of reading materials, with focus on meaning rather than on language use (Tran, 2006). Generally, an extensive reading programme is carried out to develop good reading habits, to build up knowledge of vocabulary and structure, and to encourage a penchant for reading (Shen, 2008). Studies have revealed the positive effect of ER on reading comprehension and speed, vocabulary learning, and learners' motivation and attitude towards reading (de Morgado, 2009; Macalister, 2008; Shen, 2008; Tanaka & Stapleton, 2007; Tran, 2006)

Extensive reading is not limited to hardcopies. Reading materials can also be read on a mobile phone. The many benefits of utilising mobile phones in an informal learning setting have sparked interest among educationists. A feature of the mobile phone known as "texting" or "short message service (SMS)" is fast becoming one of the popular communication modes (Librero *et al*., 2007; Goh & Kinshuk, 2006). Research has cited that students are frequently engaged in text messaging. Thorton and Houser (as cited in Caverly *et al*., 2009) discovered that 71% of Japanese college students preferred the use of text messages to email and 93% appreciated receiving English lessons sent to their mobile phones. Students are found to be

enthusiastic about mobile technologies (Thorton & Houser as cited in Caverly *et al.*, 2009; Librero *et al.*, 2007; Unnukka, 2007; Landers, 2002). This study is conducted to investigate the extent to which the use of mobile phones, specifically that of the SMSes, helps improve students' reading comprehension. The SMS service will be used as a platform to provide materials for an informal extensive reading programme.

Objective of the Study

The main purpose of this study is to determine whether texting reading comprehension exercises to students can help improve their reading performance. It also intends to determine which level of proficiency class would benefit from such an exercise.

Methodology

The subjects of this study consisted of students who owned a mobile. Purposeful sampling was employed where at least two or more groups from each level of English proficiency classes were chosen for this study. The study did not permit random assignment of subjects, as the subjects were already in intact groups. Hence the quasi-research design was adopted. The use of comparative data inherent in an experimental design helps to increase a researcher's confidence "that observed outcomes are the result of a given program or innovation instead of a function of extraneous variables or events" (Gribbons & Hermans, 1997, p.2). In this study, data gathered from experimental and control groups were compared to see if the particular method of learning contributes significantly to students' language performance. The diagram of the design is as displayed in Figure 7.1.

$0^1 \rightarrow x \rightarrow 0^2$	— Experimental Groups
$0^1 \rightarrow y \rightarrow 0^2$	— Control Groups
0^1 — pre-test, 0^2 — post-test, x — use SMS, y — do not use SMS	

Figure 7.1: Diagram of the Pre-Test and Post-Test Quasi-Experimental Design

Students sat for the English Placement Test at the beginning and end of the study. Reading is one of the components tested in this test. The results of the pre- and post-tests were compared to see if there was any improvement in the students' reading comprehension performance.

Reading materials were texted to students in the experimental group everyday for approximately 3 months. To ensure the suitability of the reading materials, an online Readability test was carried out. The Readability test is to measure how easy it is to read and comprehend a document and to indicate whether a text is suitable for students at a certain age or grade level. The readability test formulae used in this study were Gunning-Fog Index and Flesch Reading Ease (Stephens, 2009).

Table 7.1:Examples of Reading Materials Sent and the Gunning-Fog and Flesch Readability Index Scores

Reading Texts	Number of Characters and Spaces in-Between Words	Gunning-Fog Index Score	Flesch Readability Index Score
One thing a gorilla does not do is drumming furious tattoo on his chest after he has just cracked an opponent's spine	118	22.1	43.5
Mary Bright, a cab driver, has an annual income of $7,800. She is 53 and has been driving a taxi since 1961. She says I LOVE IT.	128	10.1	80.7
Facts tell what happened. Opinion tells what the writer thinks about what happened. News stories are supposed to tell facts.	123	8.1	73.2
The difference between the right word and the almost right is a large matter—it's between the lightning and the lightning bug.	125	13.3	77.7
There are words which have narrowed in meaning since their early days. The word GIRL was used to mean A YOUNG PERSON OF EITHER SEX.	129	8.2	95.7

*Gunning-Fog Index scores= the lower the number, the easier it is to understand the content
*Flesch Reading Ease = the higher the score, the easier it is to understand the content
*The calculation of the Gunning-Fog Index Scores and Flesch Reading Ease is based on the reading comprehension textand related questions and answers.

The calculations (based on the formulae of Gunning-Fog Index and Flesch Reading Ease) that were applied in this study suggest that the short reading comprehension texts and comprehension questions and answers sent to students in the form of SMSes were suitable for their level.

Subjects

A total of 651 students following language proficiency courses at the language centre (CELPAD) of the International Islamic University, Gombak, Malaysia, were chosen for this study. The students were divided into two groups: 438 students in the experimental group and the remaining 213 in the control group. There were 248 male and 190 female students in the experimental group. These students were taking English proficiency courses offered by the language centre, which cover language components such as Reading, Writing, Grammar, Listening, and Speaking. The sample was taken randomly from each level of the proficiency courses. The courses involved were LE 0225 (English Language II), LE 0320 (English Language III), LE 0420 (English Language IV), LE 0520 (English Language V), and LE 0620 (English Language VI). The number of students who took part in this study is given in Table 7.2.

Table 7.2:English Proficiency Courses Involved

Courses	Frequency	Percent	Valid Percent	Cumulative Percent
LE 0620	207	31.8	31.8	31.8
LE 0520	236	36.3	36.3	68.0
LE 0420	134	20.6	20.6	88.6
LE 0320	55	8.4	8.4	97.1
LE 0225	19	2.9	2.9	100.0
Total	651	100.0	100.0	

The English language courses serve as a prerequisite, which means that students sitting for each course have to obtain the specified English band in order to either advance to the degree courses offered by their respective faculty, proceed to the next level of English proficiency course, or repeat the same English course. Those who are taking these English courses range from beginners to intermediate-level students.

CELPAD English Placement Test

The English Placement Test (EPT) conducted by CELPAD is meant to place each student in the appropriate English class to match the student's current level of English. The marks in the EPT are expressed in bands from 1 to 9. Students have to attain a minimum of Band 6 in the EPT before they begin the courses offered by their faculty. Those who do not meet the requirement based on the results obtained in the EPT will be placed at the appropriate level in pre-sessional English language courses at CELPAD. It is not a test to pass or fail students. The language courses, which are divided into six levels, focus on developing students' skills in speaking, reading, and writing to achieve the level required for university study. Table 7.3 shows how the placement of students is done.

Table 7.3: Placement of Students in English Language Courses

Band Achieved	Level
1	2
2	3
3	4
4	5
5	6
6	Exit

Data Analysis

The data obtained from the pre-test and post-test of the reading comprehension tests were analysed using SPSS. Standard statistical procedures were used to analyse the data.

Analysis of the reliability coefficient of the tests using Cronbach alpha was carried out to gauge the reliability of the tests used to obtain consistency and "an accurate representation of the total population under study" (Joppe, 2000, p. 1). The results are given in Table 7.4.

Table 7.4: Reliability Analysis of Test Items

Test	No. of Items	Pre-/Post-Test	Alpha Value
Reading Comprehension Test	35	Pre-test	.66
Reading Comprehension Test	35	Post-test	.63

The reliability analysis (Table 7.4) shows that the reliability coefficients of the tests involved were within the acceptable range. The alpha value of the pre-test for the reading comprehension test was .66 and the alpha value of the post-test was .63. The alpha value for both pre- and post-tests of reading comprehension fell within the range reported in the TOEFL (1997) Test & Score Manual (.60 to .95). The reliability coefficient of TOEFL, a standardised international English language paper for foreign language learners, was used as an indicator to gauge the reliability of the reading comprehension paper prepared by CELPAD.

Statistical Analyses

The analysis of results was carried out by comparing the scores that the students obtained in the pre- and post-tests, and the overall score performance (post-test minus pre-test) of the reading comprehension tests. First, a one-way ANOVA was carried out on the pre-test scores of the reading comprehension test to determine the initial equivalence among the groups who were involved in the text messaging activity. The results of the analysis in Table 7.5 highlight that there were at least two group means that were significantly different from each other in the pre-test: $F(4, 433)=17.17$, $p<.05$. A one-way ANOVA was also run on the post-test scores of the reading comprehension test and it was found that there were at least two group means that were significantly different from each other: $F(4,433)=14.78$, $p<.05$. It is assumed that the significant difference in at least two group means is due to the fact that the groups involved were from different levels of English proficiency.

Table 7.5: One-Way ANOVA for the Reading Comprehension Pre- and Post-Tests

		Sum of Squares	df	Mean Square	F	Sig.
Pre-Test	Between Groups	103.42	4	25.86	17.17	.000
	Within Groups	652.12	433	1.50		
	Total	755.55	437			
Post-Test	Between Groups	86.34	4	21.59	14.78	.000
	Within Groups	632.49	433	1.46		
	Total	718.84	437			

In order to determine which specific groups differed from each other, a post-hoc test was carried out. Table 7.6 highlights the mean difference between the various groups.

Table 7.6: A Post-Hoc Test: Multiple Comparisons of the English Language Proficiency Courses in the Reading Comprehension Pre-Test

Dependent Variable	(I) Class	(J) Class	MeanDifference(I-J)	Std. Error	Sig.	95% ConfidenceInterval	
						Lower Bound	Upper Bound
Reading Pre-Test	LE 0620	LE 0520	0.84	0.14	.000	0.44	1.25
		LE 0420	0.73	0.16	.000	0.29	1.17
		LE 0320	1.54	0.24	.000	0.87	2.21
		LE 0225	1.60	0.30	.000	0.77	2.42
	LE 0520	LE 0620	-0.84	0.14	.000	-1.25	-0.44
		LE 0420	-0.11	0.15	.947	-0.53	0.30
		LE 0320	0.69	0.24	.035	0.03	1.36
		LE 0225	0.75	0.29	.089	-0.06	1.57
	LE 0420	LE 0620	-0.73	0.16	.000	-1.17	-0.29
		LE 0520	0.11	0.15	.947	-0.30	0.53
		LE 0320	0.80	0.24	.011	0.12	1.49
		LE 0225	0.87	0.30	.038	0.03	1.70
	LE 0320	LE 0620	-1.54	0.24	.000	-2.21	-0.87
		LE 0520	-0.69	0.24	.035	-1.35	-0.03
		LE 0420	-0.80	0.24	.011	-1.49	-0.12
		LE 0225	0.06	0.36	1.000	-0.92	1.03
	LE 0225	LE 0620	-1.60	0.30	.000	-2.42	-0.77
		LE 0520	-0.75	0.29	.089	-1.57	0.07
		LE 0420	-0.87	0.30	.038	-1.70	-0.03
		LE 0320	-0.06	0.36	1.000	-1.03	0.92
	LE 0225	LE 0520	-0.69	0.23	.039	-1.36	-0.02
		LE 0420	-0.80	0.24	.014	-1.49	-0.11
		LE 0225	0.06	0.30	1.000	-0.80	0.92
	LE 0225	LE 0620	-1.60	0.24	.000	-2.30	-0.89
		LE 0520	-0.75	0.24	.031	-1.45	-0.05
		LE 0420	-0.87	0.24	.012	-1.58	-0.14
		LE 0320	-0.06	0.30	1.000	-0.92	0.80

* The mean difference is significant at the .05 level.

Based on the analysis of results (Table 7.6), there were significant differences between the groups as a whole in terms of their overall performance in the pre-test of the reading comprehension paper. The groups involved in the study were students from lower to higher English language proficiency courses, namely LE 0225 (English Language II), LE 0320 (English Language

III), LE 0420 (English Language IV), LE 0520 (English Language V), and LE 0620 (English Language VI). The overall mean score of the students in LE 0620 (English Language VI) was significantly different when compared with the mean score of the students in other proficiency courses, namely LE 0520 (p= .000), LE 0420 (p= .000), LE 0320 (p= .000), and LE 0225 (p= .000). However, the difference in the mean score performance was not significant when these courses (LE 0520, LE0420, LE0320, LE 0225) were compared against each other (LE 0520 and LE 0420, p= .947; LE 0520 and LE 0225, p=.089; LE 0320 and LE0225, p=1.000).

In the reading comprehension pre-test, the mean score of students from an upper proficiency course, namely LE 0620 (English Language VI), was significantly different from the mean scores of the lower proficiency courses, namely LE 0520 (English Language V), LE 0420 (English Language IV), LE 0320 (English Language III), and LE 0225 (English Language II). However, when the mean scores of these courses, namely LE 0520, LE0420, LE0320, and LE 0225, were compared against each other, it was found not to be significant.

There was no obvious pattern that emerged in the reading comprehension post-test. Table 7.7 shows that the mean score of the students was significantly different when the mean scores were compared. For example, the mean score of the higher proficiency course, LE0620 (English Language VI), was statistically different when compared with the mean scores of the lower proficiency courses such as LE 0420 (English Language IV) (p=.004), LE 0320 (English Language III) (p=.000), and LE 0225 (English Language II) (p=.000). Except for LE 0620 (English Language VI) and LE 0420 (English Language IV), the mean score obtained by students in the course LE 0520 (English Language V) was significantly different from the mean scores obtained by students in the other two courses, LE 0320 (English Language III) (p=.000) and LE 0225 (English Language II), (p=.001). For the lower intermediate language proficiency course, LE 0420 (English Language IV), the significant difference in mean score could be seen when the course (LE 0420) was compared with three other courses, namely LE 0620 (English Language VI) (p=.004), LE 0320 (English Language III) (p=.002), and LE 0225 (English Language II) (p= .004). Almost all of the English language proficiency courses, regardless of higher or lower proficiency levels, showed significant differences in the mean score performance in the reading comprehension post-test.

Table 7.7: A Post-Hoc Test: Multiple Comparisons of the English Language Proficiency Courses in the Reading Comprehension Post-Test

Dependent Variable	(I) Class	(J) Class	MeanDifference(I-J)	Std. Error	Sig.	95% ConfidenceInterval	
						Lower Bound	Upper Bound
Reading Post-Test	LE 0620	LE 0520	0.49	0.14	.006	0.09	0.89
		LE 0420	0.56	0.16	.004	0.12	0.99
		LE 0320	1.48	0.24	.000	0.82	2.14
		LE 0225	1.61	0.29	.000	0.80	2.43
	LE 0520	LE 0620	-0.49	0.14	.006	-0.89	-0.09
		LE 0420	0.06	0.15	.995	-0.36	0.48
		LE 0320	0.99	0.23	.000	0.33	1.64
		LE 0225	1.12	0.29	.001	0.31	1.92
	LE 0420	LE 0620	-0.56	0.16	.004	-0.99	-0.12
		LE 0520	-0.06	0.15	.995	-0.48	0.36
		LE 0320	0.92	0.24	.002	0.25	1.60
		LE 0225	1.06	0.30	.004	0.23	1.88
	LE 0320	LE 0620	-1.48	0.24	.000	-2.14	-0.82
		LE 0520	-0.99	0.23	.000	-1.64	-0.33
		LE 0420	-0.92	0.24	.002	-1.60	-0.25
		LE 0225	0.13	0.35	.996	-0.83	1.09
	LE 0225	LE 0620	-1.61	0.29	.000	-2.43	-0.80
		LE 0520	-1.12	0.29	.001	-1.92	-0.31
		LE 0420	-1.06	0.30	.004	-1.88	-0.23
		LE 0320	-0.13	0.35	.996	-1.09	0.83

* The mean difference is significant at the .05 level.

To determine whether the SMS text messaging facility contributed significantly to students' ability to comprehend texts, the difference in the reading comprehension pre- and post-test scores was calculated. The difference between the scores was obtained by subtracting the post-test scores from the pre-test scores. Table 7.8 shows the details of the computed analysis:

Table 7.8:Descriptive Statistics of the Means and Standard Deviations of the Reading Comprehension Pre- and Post-Tests

		N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound			
Read Pre-Test	LE 0620	130	6.28	1.22	0.10	6.07	6.49	4.00	9.00
	LE 0520	149	5.43	1.26	0.10	5.23	5.64	3.00	8.00
	LE 0420	109	5.55	1.24	0.11	5.31	5.79	2.00	8.00
	LE 0320	31	4.74	1.18	0.21	4.30	5.18	2.00	7.00
	LE 0225	19	4.68	0.94	0.21	4.22	5.14	3.00	6.00
	Total	438	5.63	1.31	0.06	5.51	5.76	2.00	9.00
Read Post-Test	LE 0620	130	6.35	1.23	0.10	6.13	6.57	3.00	8.00
	LE 0520	149	5.86	1.13	0.09	5.67	6.04	3.00	8.00
	LE 0420	109	5.79	1.29	0.12	5.55	6.04	2.00	8.00
	LE 0320	31	4.87	1.14	0.20	4.45	5.29	2.00	7.00
	LE 0225	19	4.73	1.09	0.25	4.20	5.27	3.00	6.00
	Total	438	5.87	1.28	0.06	5.75	5.99	2.00	8.00

The computed analysis was run using a one-way ANOVA. In order to refer to the ANOVA table, one of the assumptions of the one-way ANOVA is that variances of the groups compared are similar (Coakes & Steed, 2003). To fulfil this assumption, a test of homogeneity of variance was carried out. Table 7.9 shows the result of Levene's test of homogeneity of variance. It indicates that the assumption of homogeneity of variance is met as the significance value is greater than .05. Levene's F statistic has a significance value of .582 for the reading pre-test and .150 for the reading post-test.

Table 7.9: Levene's Test of Homogeneity of Variances for the Reading Comprehension Pre- and Post-Test

	Levene Statistic	df1	df2	Sig.
Reading pre-test	0.715	4	433	.582
Reading post-test	1.693	4	433	.150

The analysis presented in Table 7.10 indicates that there was an overall improvement in the performance of the students based on the comparison of the mean scores of the reading comprehension pre- and post-tests. The mean score of the pre-test was 5.63 and the mean score of the post-test was 5.87. The difference in mean scores when the pre-test scores are subtracted from the post-test scores (5.87 - 5.63 = 0.24) shows that there was an improvement in the performance of the students in the reading comprehension paper. To find out which level of the proficiency course improved the most, the difference in the means of the score is shown here by subtracting the post-test scores from the pre-test scores for each of the proficiency courses involved in the study. It was found that the LE 0520 (English Language V) group improved the most (5.86 - 5.43 = 0.43), followed by LE 0420 (English Language IV) (5.79 - 5.55 =0.24),

LE 0320 (English Language III) (4.87 - 4.74 = 0.13), LE 0620 (English Language VI) (6.35 -6.28=0.07), and LE 0225 (English Language II) (4.73 - 4.68 = 0.05). Although the results suggest there was an overall improvement in reading comprehension, a one-way analysis of variance (Table 7.7), comparing the means of difference in the reading comprehension pre- and post-tests, indicates that the variance in the scores was low: $F(4, 433)=2.03$, $p<.05$. This suggests that although there was an improvement in the reading comprehension ability across the groups that participated, the increase in scores was not statistically significant.

Table 7.10: A One-Way Analysis of Variance Comparing the Means of the Difference in Reading Comprehension Pre- and Post-Test Scores

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	9.82	4	2.46	2.03	.088
Within groups	521.48	433	1.20		
Total	531.30	437			

The results this far have not indicated whether there was an improvement in the students' band score. In IIUM, the passing requirement to enable most of the students to exit the English language proficiency courses is a minimum of Band 6 for the overall language components tested (except for English Language & Literature, TESL and English for International Communication Programmes which require Band 6.5). The highest English language band is Band 9, whilst the lowest is Band 1. To investigate whether a significant mean difference exists among the various levels of proficiency, a one-way ANOVA was carried out. An examination of the Levene's test for homogeneity of variances in Table 7.11 suggests that this assumption has not been violated ($p <.05$) and thus the interpretation of the ANOVA could proceed.

Table 7.11:Levene's Test of Homogeneity of Variances for the English Language Bands Obtained in the Reading Comprehension Pre- and Post-Tests

	Levene Statistic	**df1**	**df2**	**Sig.**
Bands obtained in reading pre-test	1.742[a]	6	430	.110
Bands obtained in reading post-test	1.212	6	431	.299

The ANOVA analysis (Table 7.12) indicates that there were significant mean differences across the population in terms of the English language bands obtained in the reading comprehension pre-test, $F(7, 430)= 17.92$, $p<.05$), and post-test, $F(6, 431)= 16.65$, $p<.05$).

Table 7.12:One-Way ANOVA for the English Language Bands Obtained in the Reading Comprehension Pre- and Post-Tests

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Pre-Test (Bands)	Between groups	120.00	7	17.14	17.92	.000
	Within groups	411.30	430	0.96		
	Total	531.30	437			
Post-Test (Bands)	Between groups	99.98	6	16.66	16.65	.000
	Within groups	431.32	431	1.00		
	Total	531.30	437			

In order to determinene the means that are significantly different from each other, a Tukey's HSD test was carried out. However, multiple comparisons of the students' performance on the basis of English language bands could not be performed on the reading comprehension pre-test because at least one group had fewer than two cases. Nonetheless, a Tukey's HSD test could be carried out on the scores obtained in the post-test. The post-hoc test (Table 7.13) indicates that there was a significant mean difference in the number of the English language bands obtained in the post-test. For example, a significant mean difference was identified between Band 3 and Band 4 (p=.007), Band 5 and Band 3 (p=.000), Band 6 and Band 3 (p=.000), Band 7 and Band 3 (p=.000), Band 8 and Band 3 (p=.000), Band 6 and Band 4 (p=.000), Band 7 and Band 4 (p=.000), Band 8 and Band 4 (p=.000), Band 8 and Band 5 (p=.000), and Band 8 and Band 6 (p=.004).

Table 7.13:A Post-Hoc Test: Multiple Comparisons of the English Language Bands Obtained in the Reading Comprehension Post-Test.

(I) Reading Post-Test	(J) ReadingPost-Test	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Band 2	Band 3	1.70	0.77	.301	-0.59	3.99
	Band 4	0.47	0.72	.995	-1.66	2.60
	Band 5	-0.10	0.71	1.000	-2.22	2.00
	Band 6	-0.27	0.71	1.000	-2.39	1.83
	Band 7	-0.60	0.71	.981	-2.71	1.51
	Band 8	-0.90	0.72	.875	-3.03	1.23
Band 3	Band 2	-1.70	0.77	.301	-3.99	0.59
	Band 4	-1.22	0.34	.007	-2.25	-0.20
	Band 5	-1.80	0.33	.000	-2.79	-0.82
	Band 6	-1.97	0.32	.000	-2.94	-1.00
	Band 7	-2.30	0.33	.000	-3.29	-1.31
	Band 8	-2.60	0.34	.000	-3.62	-1.57
Band 4	Band 2	-0.47	0.72	.995	-2.60	1.66
	Band 3	1.22	0.34	.007	0.20	2.25
	Band 5	-0.58	0.17	.012	-1.08	-0.08
	Band 6	-0.74	0.16	.000	-1.22	-0.26
	Band 7	-1.07	0.17	.000	-1.58	-0.56
	Band 8	-1.37	0.19	.000	-1.96	-0.70
Band 5	Band 2	0.10	0.71	1.000	-2.00	2.22
	Band 3	1.80	0.33	.000	0.82	2.79
	Band 4	0.58	0.17	.012	0.08	1.08
	Band 6	-0.17	0.13	.868	-0.56	0.22
	Band 7	-0.49	0.14	.013	-0.92	-0.06
	Band 8	-0.79	0.17	.000	-1.30	-0.28

Band 6	Band 2	0.27	0.71	1.000	-1.83	2.39
	Band 3	1.97	0.32	.000	1.00	2.94
	Band 4	0.74	0.16	.000	0.26	1.22
	Band 5	0.17	0.13	.868	-0.22	0.56
	Band 7	-0.32	0.13	.212	-0.73	0.08
	Band 8	-0.62	0.17	.004	-1.11	-0.13
Band 7	Band 2	0.60	0.71	.981	-1.51	2.71
	Band 3	2.30	0.33	.000	1.31	3.29
	Band 4	1.07	0.17	.000	0.56	1.58
	Band 5	0.49	0.14	.013	0.06	0.92
	Band 6	0.32	0.13	.212	-0.08	0.73
	Band 8	-0.30	0.17	.616	-0.82	0.22
Band 8	Band 2	0.90	0.72	.875	-1.23	3.03
	Band 3	2.60	0.34	.000	1.57	3.62
	Band 4	1.37	0.19	.000	0.79	1.96
	Band 5	0.79	0.17	.000	0.28	1.30
	Band 6	0.62	0.17	.004	0.13	1.11
	Band 7	0.30	0.18	.616	-0.22	0.82
* The mean difference is significant at the .05 level.						

To be more specific, the descriptive analyses in Tables 7.14 and 7.15 show the number of students who obtained English language bands ranging from Band 2 to Band 9 in the reading comprehension pre- and post-tests.

Table 7.14: Descriptive Statistics of the Means and Standard Deviations for the Bands Obtained in the Reading Comprehension Pre-Test

Band	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Band 2	2	3.50	0.70	0.50	-2.85	9.85	3.00	4.00
Band 3	14	3.00	1.10	0.29	2.36	3.64	2.00	5.00
Band 4	78	2.59	1.14	0.12	2.33	2.84	1.00	5.00
Band 5	106	2.41	1.11	0.10	2.20	2.62	1.00	5.00
Band 6	128	2.17	1.01	0.09	1.99	2.34	1.00	5.00
Band 7	69	1.79	0.90	0.10	1.58	2.01	1.00	4.00
Band 8	40	1.60	0.78	0.12	1.35	1.84	1.00	3.00
Band 9	1	1.00	.	.	.	.	1.00	1.00
Total	438	2.22	1.08	0.05	2.12	2.32	1.00	5.00

Table 7.15:Descriptive Statistics of the Means and Standard Deviations for the Bands Obtained in the Reading Comprehension Post-Test

Band	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Band 2	2	3.50	0.70	0.50	-2.85	9.85	3.00	4.00
Band 3	10	3.40	1.42	0.45	2.38	4.42	1.00	5.00
Band 4	53	2.69	1.20	0.17	2.37	3.02	1.00	5.00
Band 5	102	2.39	1.10	0.10	2.17	2.61	1.00	5.00
Band 6	131	2.22	1.02	0.09	2.04	2.39	1.00	5.00
Band 7	90	1.91	0.88	0.09	1.72	2.09	1.00	4.00
Band 8	50	1.66	0.79	0.11	1.43	1.89	1.00	3.00
Total	438	2.22	1.08	0.05	2.12	2.32	1.00	5.00

The descriptive analyses in Tables 7.14 and 7.15 indicate that 128 students managed to obtain Band 6 in the pre-test whilst 131 students obtained it in the post-test, which shows an increase in the number of students who managed to obtain Band 6. Sixty-nine students were able to obtain Band 7 in the pre-test and the number of students obtaining Band 7 increased to 90 in the post-test. Forty students obtained Band 8 in the pre-test and the number increased to 50 in the post-test. Only 1student managed to obtain Band 9 in the pre-test and no one managed to get Band 9 in the post-test. The total number of students who managed to obtain Band 6 and above in the pre-test was 238, whilst the total number of students who managed to obtain Band 6 and above in the post-test was 271. The difference in number (271 - 238 = 33), that is, the total number of students who obtained Band 6 and above in the post-test minus the total number of students who managed to get Band 6 and above in the pre-test, shows that there was an overall improvement in the students' reading comprehension ability.

Conclusion

The analysis of results indicates that, in general, students who participated in the study were able to perform better in their reading comprehension paper. Although there was an improvement in this study (SMS reading activity), students were not able to achieve significant gains in reading comprehension. One of the reasons for the small gains in reading comprehension might be due to the short treatment period of approximately three months carried out in this study. This conclusion corresponds with Tanaka and Stapleton's (2007) claim that students may need a longer treatment period to achieve real gains in reading comprehension.

The findings support assertions made by researchers (Laouris & Eteokleous, 2005; Kukulska-Hulme, 2005; Quinn, 2002) that Mobile Learning via mobile devices can assist students to achieve their learning objectives owing to the flexibility of the format for the transmission of knowledge. These findings suggest that there is a potential in utilising mobile phones to complement classroom learning.

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{ Chapter EIGHT }

Mobile Learning in Distance Education: SMS Application in a Physics Course

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Introduction

Improvements in interactive distribution technologies allow distance learners to access amazingly complex networks of educational content and resources. New technology can provide greater support to distance learners through enhanced communication and collaboration via animated, simulated, and interactive capabilities. Educational interactions that can support the learning process in different ways play a key role in supporting reflection (Price *et al*., 2003). In a natural progression, the success of the learning process deeply depends on the capability of learners to reflect on their experiences (Schön, 1983). Elements of learner autonomy still need facilitation as (adult) learners have many responsibilities that must be balanced against the demands of learning. These responsibilities also pose barriers against scheduling in learning. Any technique that can be utilized on a frequent and regular basis can assist students in retention of information.

Mobile technology such as mobile phones and short message service (SMS) are now becoming an inextricable part of distance learners' life (Muhlhauser & Trompler, 2002). Initial studies on the use of mobile technology have demonstrated its usefulness in education (Virvou & Alepis, 2005). These studies also showed that the use of SMS resulted in increased interactions that could lead to more active learning (Markett *et al*., 2005).

This article investigates the possibility of using SMS to support formal lesson chunks, informal communication, experience sharing, and reflection regardless of where the (adult) distance learners are located.

Background

The use of SMS between cell phones or between the Internet and cell phones is now part of everyday social communication. Mobile technology promotes flexibility beyond that offered by current e-learning resources.

Several factors were considered before implementing this SMS project for the selected physics course:

- The mobile phone is a communication device that can be utilized anytime and anywhere. The hand phone is always with students. Therefore, text messages can be sent regardless of students' geographical location.
- The SMS function can be utilized as an asynchronous form of communication with a student, fostering a sense of connectivity between the lecturer and student and facilitating a supportive learning environment [6].
- Using the mobile phone would allow a short piece of information to be delivered to students without the constraints of space, time, and Internet connectivity.
- The mobile phone would form an immediate bridge in communication and activity before a more comprehensive discussion can ensue on an electronic portal. This communication is important as the lecturer may sometimes be too busy to visit the portal and students might be left waiting for some form of feedback from faculty.
- The study of physics could benefit from snippets of a lesson (small chunk of content) sent daily as short learning experiences before the students attempt some serious work.
- The use of mobile technology would complement the electronic portal in terms of learning activity and experiences.
- SMS can act as a pacing mechanism, helping students with their daily study schedule.

The Physics SMS Project

The aim of this project is to incorporate learning via SMS. Students would receive a small piece of information to facilitate study. Since the students would be working full time or part time, it would be beneficial to make studying a natural part of their everyday life, such that it does not become burdensome. As an orientation exercise, an e-mail message was sent to all students. Students were given the option of furnishing the School of Distance Education with their personal e-mail id or using the one generated by the university.

The message sent to the students read as follows:

> *"Dear JIF212 students,*
> *I hope you are all in good health. I hope you are also allocating some time for your studies, considering the festive occasion just ahead. To all our Chinese friends, I wish you a Happy Gong Xi Fa Chai.*
> *I have a reason for this message. I am going to try a pilot project of sending SMSes to you on a daily basis from Monday to Friday based on your JIF212 course. So you will get an SMS a day for 5 days.*

All the SMSes will be archived in the portal at the end of each week. I am going to try this initially for one week and then get some feedback from you.
This is what you have to do. You have to get a notebook or anything convenient to copy, in writing, the message that comes through your hand phone every day for 5 days. These will be your "notes" to assist you in your studies and revision. If possible, create a folder to store the daily messages.
FIRST of all, I will need your hand phone numbers. I would be most grateful if each of you can respond to me via this e-mail and list your name and hand phone number.
I hope to send the first message to you on Monday, provided I get your hand phone numbers. Please let your friends know or help me to alert them to check their e-mail.
If this works, it will be experimented and perhaps, one day, it can be a permanent feature in USM's distance learning activities.

Thank you for your cooperation."

The course selected for this project was the second year physics optics course with the code JIF212. The topic selected was "dispersion," which the students should have been studying at that point of time according to the course's flow of content. This course is managed by the author and lends itself well to this project as it contains many definitions and is information-rich; constructing daily text messages based on the content would set a natural pace for the students.

An important aspect of this project was to incorporate pacing by constructing the text message according to the sequence of topics in the learning materials. Students were instructed to copy, by hand, each message into their notebook to instill the habit of writing down facts and definitions as well as tips sent to them. It would mean a two-minute investment of each student's time to read and copy the message. Students were also encouraged to store the message in a folder on their mobile phones. More serious deliberations would be conducted via the forum in the electronic portal, with the event being initiated via SMS. This technique would lead to optimization of the forum and discussion of relevant topics. Students were discouraged from sending one-on-one e-mails to the course manager as this would not benefit other students in the course.

Table 8.1: Optical physics SMS notes sent to students from February 4–8, 2008

SMS	Date	Text message
1	Feb 4	Dispersion concerns the speed of light in material substance and its variation with wavelength.
2	Feb 5	In normal dispersion, the index of refraction increases as the wavelength decreases.
3	Feb 6	In normal dispersion, the rate of increase becomes greater at shorter wavelength.
4	Feb 7	In normal dispersion, for a substance of higher index of refraction, the dispersion shall also be greater.
5	Feb 8	Normal dispersion is represented by the Cauchy equation of 1836.

Methodology

The JIF 212 physics second-year course had only 17 students. Since the number of students was small, a group message was sent from the author's RMI personal mobile phone.

Once the course-related text messages were completed, a questionnaire was posted on the JIF 212 electronic portal and the students were alerted via their mobile phones to respond. The students were also asked to provide additional comments on the project. They were requested to e-mail their responses to the course manager's e-mail account. A second text message was sent to the students to remind them to respond to the questionnaire three days after the first message was sent.

Results

Thirteen students responded to the questionnaire, yielding a return rate of 76%. The questionnaire consisted of 10 questions aimed at gauging student perception of this unique use of SMS to facilitate learning. A negative statement was inserted in the middle of the questionnaire to ascertain that the students actually read all the questions and were not randomly selecting responses. The following five-point Likert scale was utilized:

Five-point Likert Scale	1 -	Strongly Disagree
	2 -	Disagree
	3 -	Not Sure
	4 -	Agree
	5 -	Strongly Agree

The statements were designed to capture different aspects of the teaching and learning processes as well as communication and the delivery mechanisms involved. It was imperative that the students understood the instructions and the text messages sent since the messages were constructed with reference to the textbook being used or the course.

This endeavour also aimed at exploring further elements of motivation and support to facilitate a regular study pattern as opposed to rote learning of a huge amount of content in a short space of time, often just before examinations.

Cost should not be a significant consideration for the student since communication from students would be minimum and only as an absolute necessity to establish further contact through the electronic portal. Lastly, the students were asked whether they considered the SMS approach suitable. The responses to the questionnaire are given in Table 8.2.

Implications of Research Findings

The responses received to the self-explanatory questions, as listed in Table 8.2, were extremely gratifying. The overwhelming consensus suggests that the mobile phone could make a strong

and viable contribution to learning in a distance education physics course. Student responses were corroborated by their additional comments:

- It is a good idea to use SMS to give information and notes.
- Use of SMS is very good. Keep it up!
- Perhaps a short question could also be sent over using this project, one that could very likely appear in the examination.

Table 8.2: Responses to the Physics SMS Project at the School of Distance Education

	Statement	N	1	2	3	4	5
1	I understood the instructions regarding the SMS project sent onthe electronic portal.	13			15%	31%	54%
						85%	
2	I had no problems receiving text messages from my lecturer.	13				23%	77%
						100%	
3	I understood the daily text message received from the lecturer.	13			23%	46%	31%
						77%	
4	The daily text message helped me in my studyof the physics course.	13			15%	31%	54%
						85%	
5	I found receiving the daily text message from my lecturer to be an inconvenience.	13	69%	31%			
			100%				
6	Text messages from my lecturer helped to motivate me to study.	13				31%	69%
						100%	
7	Text messages from my lecturer made me feel I had my lecturer's support.	13				23%	77%
						100%	
8	Text messages promoted flexibility by enabling communication with my lecturer regardless of time and place.	13				15%	85%
						100%	
9	I could afford the financial cost of text message communication with my lecturer.	13			8%	54%	38%
						92%	
10	Text messaging should be introduced as a standard form of support for physics students.	13				46%	54%
						100%	

- This project could assist us in our studies by focusing on relevant topics. As most students are employed and have family commitments as well, there is little time left for revision. This project's focus on topics to be assessed will benefit us.
- Please include where we can find details of the message from the textbook.

- There is some limitation to derivatively using the formulas or calculations.
- Thanks, this project was very useful. I hope many solutions and guidelines emerge from this project. This SMS project will help me improve my study habits.
- I would like to propose something related to this project that I believe will work for me: why don't you start with a question rather than a note? An answer or hint can be mailed out to all of us for discussion or on SMS the next day.
- An SMS of bits and parts of the topic that we have learned remind us of our life as a student even during our busy work life. It keeps us on track and provides short notes on the topics that we have gone through.
- This program should be continued, since I think it is the best way apart from the portal for all JIF212 physics students to learn this subject. At the same time, we can communicate with the professor via SMS as well.
- This is a good approach to distance education and should be implemented in all courses that have small classes, but it is not suitable for a big class.

The response to the questionnaire and the students' additional comments reflected the phenomenal success of this project. In fact, the course manager received e-mail messages from the students asking for the SMS project to be continued till the end of the semester, incorporating short message notes for revision for the final exam.

SMS is one of the "most useful and most used" applications on the mobile phone (Abas *et al*., 2009) and its use has surpassed all expectations (Markett *et al*., 2006). Vavoula and Sharples (2002) listed three ways in which learning is considered mobile:

- in terms of space, i.e., it happens at the workplace, at home, and at places of leisure;
- in terms of areas of life, i.e., it may relate to work demands, self-improvement, or leisure;
- in terms of time, i.e., it happens at different times during the day, on working days, or on weekends.

The advent of Internet facilitated online learning anytime and anywhere, albeit subject to the availability of hardware and connectivity. However, Mobile Learning technologies conform to the notion of anytime and anywhere learning as mobile devices remain with the carrier at all times (Caudill, 2007). Hence, Mobile Learning has unleashed content that would otherwise be "stuck" in a textbook or website and would either be an encumbrance or deterrent to distance learners.

While Mobile Learning can be accessed just-in-time (Traxler, 2007) depending on the learner's needs, it also has the potential to facilitate situated and authentic learning (Kukulska-Hulme & Traxler, 2007). It also results in increased learner enthusiasm, motivation, confidence, and a sense of ownership (BECTA, 2003). The inherent characteristics of Mobile Learning make it ideal for distance education. This brief investigation shows that Mobile Learning will be a boon to distance learners as it removes barriers and boundaries to learning.

Conclusion

In this digital age, distance learners should benefit from innovative uses of technology in the learning process. The mobile phone holds the distinction of being the only media or tool that has become part of the student. Provided the phone battery is sufficiently charged, international roaming enables global communication, cost effects notwithstanding. The results of this study testify to students' acceptance of the use of the mobile phone in learning, indicating greater motivation, support, and convenience in learning. It is now imperative for faculty to construct pedagogically articulated text messages that will help distance learners develop an effective study habit. This week-long research project has given us valuable insights into the shape of things to come.

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{ Chapter Nine }

Adult Learners and Mobile Learning: A Case Study

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Introduction

Of late, there has been great interest in research on Mobile Learning, or learning conducted through smartphones and other mobile devices. Southeast Asian practitionersas well as those in other regions have jumped on this bandwagon, with the appearance of several studies investigating Mobile Learning and the learning process among university students (Bui, Dinh, & Kabilan, 2012; Handoyo & Adriadi, 2012; Paolo, 2012). The focus has been on either the use of materials and learning process or the required skills. However, very little has been done to investigate the effect of Mobile Learning among adult learners (i.e. learners who are past the usual university age and are not engaged in the normal academic programme but in special adult education programmes) in the Southeast Asian context. Hence, the present study has been conducted to add to our existing body of knowledge by considering the characteristics of adult learners in the context of the implementation of Mobile Learning.

This study investigates the perceptions of trainers or facilitators involved in a special adult education programme offered in a Malaysian public university. Specifically, their perceptions of the implementation of Mobile Learning in their classes with adult learners were sought in order to better understand the potential of offering Mobile Learning to adult learners. The investigation was conducted by first examining the participants' understanding of Mobile Learning as well as their awareness of the needs of adult learners and how these needs differed from those of university-age young people. It is also expected that the investigation will shed some light on the current teaching practices used by adult trainers and facilitators when implementing Mobile Learning; most importantly, however, the present study hopes to help us understand how Mobile Learning can be better implemented in adult education by considering the characteristics of the adult learners.

Based on these objectives, the following are the research questions of the present study.

1) What is the participants' overall understanding of Mobile Learning and of their adult learners' characteristics?

2) How do the participants incorporate Mobile Learning in their courses?
3) How do the participants consider the characteristics of adult learners in conducting their lessons through Mobile Learning?
4) What challenges do the participants face when integrating Mobile Learning into their adult classes?

Theoretical Framework

The Advancement of Technology & Mobile Learning

The 21st century is believed to be an era of digital natives and digital immigrants (Bui *et al*., 2012). There is a strong growth in the use of technology in daily life. Information and communications technology (ICT), once a luxury, is now a necessity. The introduction of the internet and ICT in university classrooms has been followed by demands for the incorporation of Mobile Learning. Students in the new millennium will be regular users of the internet, and online applications have a different set of learning needs than previous generations of students and different preferences in terms of how they are taught. Many of these relate to the use of mobile devices such as smartphones, MP3 players, iPads, iPods, and laptops which support Mobile Learning.

This rapid advancement of technology has also resulted in "an impetus to increasingly develop online materials" (Mills, Gayner, & Harvey, 2005, p. 43). Teachers, lecturers, and facilitators across the globe have had the opportunity to upload learning materials on-line, providing a rich pool of material accessible to their students or the world at large at any time and any place.

Mobile Learning is an extension of electronic learning (e-learning) and ultimately distance education, which was previously carried out through physical mail. However- Mobile Learning has a unique characteristic which differentiates it from the previous two, in that it enables learning to take place across many more settings and contexts. Students do not need to be at a fixed, predetermined setting, such as the classroom or the computer lab, to follow a class conducted via Mobile Learning. Liang Ting (2005) states that there are various mobile communication mechanisms that support Mobile Learning, such as voice communication, access to learning portals on the internet, and learning through SMS (text messages), and that Mobile Learning embeds learning into the learner's daily life, by developing learning materials in formats which do not have high bandwidth demands and can be easily delivered through wireless networks to mobile devices.

With this in mind, teachers, lecturers, and facilitators need to be creative in finding new ways to provide content to their mobile students and in the selection of teaching materials, activity development, instruction, and assessment. As student mobility and the ability to access information at a predetermined time (synchronous) or not (asynchronous) become important factors in lesson design, Mobile Learning facilitators need to reconsider how they engage their students. There is a need for a new kind of literacy—a 'technology literacy' among both students and the instructors, who may need to unlearn and relearn some skills in order to live in the same era as their technology-savvy students.

According to the International ICT Literacy Panel (2002, p. 2), technology literacy is defined as the "ability to use digital technology, communication tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society". These concepts are further elaborated as below.

1) Access: know how to collect and/or retrieve information
2) Manage: apply an existing organisational or classification scheme
3) Integrate: interpret and represent information, which may involve summarising, comparing, and contrasting
4) Evaluate: make judgements about the quality, relevance, usefulness, or efficiency of information
5) Create: generate information by adapting, applying, designing, inventing or authoring it

(2002, p. 3)

Like other innovation in education, Mobile Learning faces several challenges. According to Barker, Krull, and Mallinson (2005), the challenges of implementing Mobile Learning are device limitations; instructional, training, safety, security, and maintenance issues; and implementation cost.

Another challenge relates to instructors who may lack knowledge of mobile pedagogy or 'mobigogy'. According to Keough (2005), mobigogy can be a means of unifying pedagogy, the science and art of teaching children or university-age youth, and andragogy, the science and art of teaching adults. As, in a mobile situation, instructors are no longer in full control of their classes and learners are able to access knowledge at almost any time and place, there is a need for a new set of learning and teaching skills and strategies; and as Mobile Learning is fairly new to many university instructors in developing countries like Malaysia, there is also a strong likelihood that mobigogy is also unfamiliar (Barker, Krull & Mallinson, 2005 ; Mahamad, Ibrahim, & Mohammed Taib, 2010; Young-Kyun & Dong-Uk, 2005).

Adult Learners & Their Characteristics

Rogers (2002, p. 39) claims that the word 'adult' can refer to 'a stage in a life cycle'. In other words, biologically, a person is first a child and then a youth before reaching the adult stage. The term 'adult' can also refer to the social role given to a person who plays a fully independent or responsible role in society. This person is seen as a contributor to the society and plays a role in weaving its social fabric.

Knowles (1990, p. 24) has proposed a more systematic approach to defining the term "adult", in which understanding what an adult is means considering both social and psychological aspects. Socially, to Knowles, a person is an adult if he or she is capable of performing the social roles typically assigned by his or her culture, such as parent, spouse, worker, or responsible citizen. Psychologically, one is considered an adult when he or she is capable of making decisions and taking full responsibility of the outcomes of those decisions. In other words, he or she is essentially responsible for his or her own life. Adult learners have a

unique set of characteristics unlike those of regular university students, namely 'self-concept', 'experience', and 'time perspective'.

In the simplest terms, self-concept is the image people have of themselves. According to Knowles, "as people grow, their self-concept moves from being a dependent personality to a self-directing one" (1990, p. 25). The ability to be autonomous is often associated with adult learners' self-concept. This characteristic has implications for how adults prefer to be taught or trained. Specifically, much literature has reported that adult learners prefer a learner-centred approach (Brookfield, 2004; Faizah, 2004; Faizah & Hazadiah, 2009; Rogers, 2002).

On the same note, it is important to realise that the degree of autonomy among adult learners may vary according to the context and individual differences (Hanson, 1996). Hanson (1996) comments that adults "re-enter education after some time away from school [and] may want to be treated as children" (1996, p. 196). In addition, it is quite interesting to notice that autonomy "is limited by what the social culture permits" (Rogers, 2002, p. 71). It is generally known, for instance, that in many societies the local culture does not encourage the development of autonomy in some groups of people, such as married women.

The second distinctive characteristic of adult learners is 'experience'. Knowles (1990, p. 237) comments that adults have more experience than young people do, making them a "rich resource in the classroom". This notion had been put forward earlier by Mocker (1980, p. 35) who claims that "…adults enter an educational activity with a greater amount of experience from which they can relate new experience". The implication for the learning and teaching process is that there is a need for instructors to provide learner-oriented activities. There need to be materials used which have been generated by the learners themselves. Rogers (2002, p. 73) further adds that while for children, experience is something that happens to them from outside, for adults, it is more internal, serving to determine who they are and to create their sense of identity. In other words, adults feel more of a sense of ownership and inextricability from their past experiences. Hence, when this experience is devalued or ignored, not only the experience but also the person is rejected.

In practice, instructors need to be aware that some adults may have formed bad learning habits on the basis of their experience which may not be helpful in their learning process (Knowles, 1990). For example, the fact that they are used to teacher-centred classes due to their previous education may cause them to have difficulties coping in an 'adult class' which is 'learner-centred' if they are not as oriented to learner-centred education as their classmates. Another possible negative habit mentioned by Knowles is "biases, presuppositions that close one's mind to new, fresh ideas" (1994, p. 59).

The third and final characteristic of adult learners considered here is 'time perspective'. Mocker (1980, p. 35) claims that "…adults enter (an educational activity) with more specific and immediate plans for applying newly acquired knowledge", while Knowles (1990, p.237) further claims that 'as adult learners need to be equipped to overcome their current problems, they want to put what they learn to immediate use'. In this conception, adult learners are perceived as motivated learners who are driven by intrinsic rather than extrinsic factors. As Knowles further elaborates, adult learners are 'mostly motivated to learn because they are seeking solutions to the problems they encounter in their roles as parents, workers and so on'. Gill (2001, p. 1) concurs with Knowles when she claims that, "…[t]he needs of adult learners are very simple. They do not need the basics; they need answers to particular questions…. The

adult learners want information that is useful immediately'. A clear implication is that trainers or facilitators need to be 'people-centred [rather] than subject-matter-centred" (Knowles, 1990, p. 238).

There is, however, a disagreement on the 'time-perspective' of adult learners. Although some consider adult learners to be highly driven by intrinsic factors, others believe that they could also be motivated by extrinsic factors (Brookfield, 1986; Rogers, 2002). This is particularly true amongst adult learners who are put back into education by their employers (where pleasing the employer or career advancement is the extrinsic motivation). In these cases, instead of taking the learning experience as something which could be satisfying and meaningful, the learners tend to conceive their learning as more 'instrumental' (Brookfield, 1986; Rogers, 2002).

At this point in the discussion, it is worth noting that all these are merely assumptions; that is, the characteristics mentioned are said to be commonly expected of an adult. Hence, there should be flexibility in applying them, and we should make efforts to understand why some adults may not be as described. As part of these efforts, we need to give attention to individual demographic profiles.

Methodology

This study aims to investigate the perceptions of a selected group of adult instructors on the implementation of Mobile Learning in their classes. Specifically, their views and insights were sought on the strengths of and challenges involved in Mobile Learning, as well as their teaching strategies when implementing Mobile Learning to a group of adult learners (in-service English language teachers).

As the study's goals thus require a descriptive approach to these attitudes, a case study is seen as the most suitable approach. According to Faizah (2004, p. 86), a case study can be a valuable research method, as it 'reveals a wealth of enlightening information through words and descriptions that a quantitative study might not be able to produce'. Patton (1990) notes that a case study enables the researcher to investigate an identified issue in depth in its actual setting. The fact that the present study took place in a natural setting without any manipulation of variables further confirms the appropriateness of the choice of methodology.

Additionally, as established by Yin (1994), a case study is an empirical inquiry which is meant to investigate a specific phenomenon in an actual context using various sources of data. Merriam (1988) makes a similar observation, claiming that a case study is an exploration of a unit or system through an in-depth data collection and analysis using various methods.

Some may argue that case study inevitably lacks breadth and may be inadequate in terms of its ability to support valid generalisation to a larger population. In advocating the case study design, Merriam (1988) states that, 'the interest is in process rather than in outcomes, in context rather than a specific variable, in discovery rather than confirmation'. Yin further states that, "case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes" (1994, p.10). In simpler terms, Yin claims that the researcher's aim is "to expand and generalise theories and not to enumerate frequencies" (1994, p. 10).

Several measures were used in the present case study to ensure reliability and validity. The following table lists the relevant issues and the tactics used to overcome them. The phase of research in which the tactics were used is also identified.

Table 9.1: The present study's case study tactics (adopted from Yin, 1994)

Tests	Case study sactics	Phase of research in which tactic occurs
Construct validity	▪ use multiple sources of evidence ▪ establish chain of evidence ▪ have key informants review a draft case - study report	▪ data collection ▪ data collection ▪ composition
Internal validity	▪ do pattern-matching ▪ do explanation-building ▪ do time-series analysis	▪ data analysis ▪ data analysis ▪ data analysis
External validity	▪ use replication logic in multiple case studies	▪ research design
Reliability	▪ use case study protocol ▪ develop case study data base	▪ data collection ▪ data collection

The Setting

The TESL Programme at Universiti Teknologi MARA in Shah Alam, Selangor, Malaysia, was first established in 1988 under the purview of Centre for Preparatory Studies, Institut Teknologi MARA. During the first ten years after its establishment, the programme was a joint degree between Institut Teknologi MARA and Universiti Kebangsaan Malaysia, which awarded the degree. In 1998, Institut Teknologi MARA was upgraded to a university and is known as Universiti Teknologi MARA. The Faculty of Education was also established in the same year in Universiti Teknologi MARA. The joint TESL programme with Universiti Kebangsaan Malaysia ended in 1998 as it was wholly run by the Faculty of Education, Universiti Teknologi MARA. Hence, subsequent intakes of TESL students had their education entirely at University Teknologi MARA.

The TESL programme is the largest programme in the faculty. Admittance is based on the candidate's Malaysian Certificate of Education results (a public examination sat by Malaysian students at the end of their secondary level school, i.e. Form Five), or other matriculation programme qualifications. The programme also accepts diploma-holders and in-service teachers who have earned teaching certificates from local teacher training colleges. As in 2011, the faculty began offering a new online degree programme to the in-service teachers due to a request from the Ministry of Education, which had identified a group of in-service teachers who needed to obtain their first degree. The program was online to meet the needs of these individuals, who needed to keep their jobs at the same time as they pursued their studies. Students would attend a monthly meeting throughout their studies. In the online learning process, the trainers played the role of facilitator, which required them to make full use of the online learning system hosted by a centre within the university. The facilitators were also encouraged to be creative

in their teaching strategies and include various forms of interactive learning utilising existing technology such as Facebook, Twitter, blogs, and wikis. As they only met face to face with their students once a month, the trainers were encouraged to stay in close communication with them using relevant technology and communication tools.

The Participants

As this is a case study investigating the perceptions of facilitators in the online teacher training programme, a purposive sampling technique was employed to determine the participants. Patton claims that a purposive sampling enables the researcher to select participants who are 'information rich' (1990, p. 169). For the purpose of the present study, several criteria for participant selection were identified; participants needed to be

1) lecturers teaching in the Faculty of Education at UiTM;
2) teaching an Education course (the programme also provides English proficiency and Linguistic and Literature courses);
3) involved as the facilitator in the special adult education programme for in-service English language teachers;
4) previously exposed to Mobile Learning; and
5) implementing Mobile Learning in their course(s).

It is worthy of note that all the participants were female; although gender was not one of the variables considered, the faculty is dominated by female lecturers, and, only a small percentage of the male lecturers were involved as facilitators in the adult education programme during the course of the study.

Initially, three participants were identified. However; another prospective participant was identified upon the third participant's recommendation (using the snowball method). This resulted in the final inclusion of four participants in the study. After a briefing on the purpose of the study, all participants gave voluntary consent for their involvement. As the study is qualitative in nature and relies heavily on feedback from the participants, an overt approach is important in ensuring the researcher access to the full range of participants' perceptions of m-learning implementation in their courses (Patton, 1990, p.130).

Each participant was interviewed individually for between one and a half and two hours. In a qualitative study such as the present one, 'saturation point' is an important stage in data analysis (Lincoln & Guba, 1985), achieved when there are redundancies in the information elicited from the participants or in other words, when there is no more new information. In the present study, though saturation point was achieved by the time the third participant was interviewed, the researcher still proceeded to interview the fourth participant (the one identified by the snowball method).

The Instruments

A semi-structured interview and document analysis served as the instruments in the present study. The use of different sources of data enables triangulation in the data analysis. Glesne and Peshkin (1992), define triangulation as a process which aims to build trustworthiness in qualitative studies by crosschecking data from different sources. In other words, multiple sources of data and multiple methods are used to confirm findings and assure that the information from various sources is consistent.

A semi-structured interview was conducted with each participant. The following is the interview protocol which guided the researcher.

1) In your opinion, what is Mobile Learning?
2) How can you describe your adult learners' characteristics?
3) Considering them as adult learners, what are some activities which could be incorporated in Mobile Learning?
4) How do you strategise your Mobile Learning sessions to suit adult learners' needs?
5) Based on your experience, what are the common challenges in implementing Mobile Learning among adult learners?

Each interview lasted between one hour and a half and two hours. The interviews were conducted informally in the respective participants' classrooms to ensure an unthreatening atmosphere. As the researcher and the participants were colleagues of at least three years' standing, mutual trust had already been already established.

Samples from the participants' lesson plans were analysed. The particular aspects of the lesson plans observed were the materials used, the activities conducted, and the instructions given. Additionally, whenever possible, the participants provided relevant evidence of their students' work that had been completed via Mobile Learning. These included SMS exchanges, Facebook entries, and tweets.

Data Analysis

A thematic analysis was used; three common processes of data analysis as proposed by Bogdan and Biklen (1992) and Miles and Huberman (1994) were followed. These three processes are data reduction, data display, and conclusion drawing. The first is a process where relevant data in the form of notes and transcriptions are selected and extracted. The relevant data are then coded according to the themes identified from the literature. Data display, in contrast, prepares the selected data for presentation after coding. It is important to note that the first two processes are done repeatedly until the final coding categories are established. Finally, conclusions are drawn. In the present paper, two inter-raters were engaged in two rounds of coding and rating. Based on Cohen's (1960) test of agreement, an inter-rater reliability of 0.95 was achieved, suggesting a consistent interpretation of the data during the analysis. This allowed the researcher to proceed with her analysis and write-up.

Findings

The discussion of the findings is organised according to the research question. In elaborating on the findings, attempts were made to include relevant excerpts from the interviews and evidence from the document analysis.

RQ 1: What is the participants' overall understanding of Mobile Learning and of their adult learners' characteristics?

During the semi-structured interview, several questions were posed to directly elicit relevant data from the participants *(In your opinion, what is Mobile Learning? How can you describe your adult learners' characteristics?)*. Based on the thematic analysis of the participants' responses, it is discovered that the participants had yet to fully understand and thoroughly conceptualise the terms 'Mobile Learning' and 'adult learners'. This was evident from their simple descriptions of Mobile Learning and adult learners.

In describing what they knew of Mobile Learning, for instance, the participants generally spoke of e-learning and the application of online materials. When prompted further, only one participant was able to relate to the idea of using smartphones as one of the tools. Unfortunately, the potential of her smartphone as an educational tool as she saw it was limited to her own private uses (such as finding learning materials online or responding to class questions via email). There was no mention of encouraging her adult learners to use their smartphones to access further information. The following excerpts taken from her interview provide evidence.

> *...Mobile Learning is very closely related to e-learning. You see, we are now in the digital era, so everything goes digital. I always use the emails to stay in communication with my students. The i-learn portal is very good, as it provides easy access to my materials. My students can go to the i-Learn portal, search for my course and get all the materials I uploaded for them. (Participant 3)*

Upon giving this response, the participant was prompted to discuss the use of other communication tools besides e-mail and the online portal provided by the university. The following is her comment.

> *....oh yes, the other possible tool would be my smartphone. Thank god for my iPhone. I was able to receive a video call from one of my students, who I suppose was also using an iPhone. That was when she was really desperate and wanted to discuss something very important with me. Another thing, I receive SMSs, many of them also from my students asking about the course. And, of course, the server always makes you frustrated, especially when you need to check for some information from the internet immediately so that you can tell your students. Luckily, I have speedy service from my iPhone. I was able to check the information I needed and be ready for my students (Participant 3).*

Interestingly, this participant also mentioned that she used her smart phone to access the internet during her monthly meetings, when she could not rely on the university's server. It is obvious that she was relying on her smartphone for communication purposes. Unfortunately, she was not able to encourage her adult learners to use their smartphones to access information from the internet in the same way. Their use of smartphones was very limited as she was not able to describe any notable smartphone use by her students.

On a similar note, none of the participants was able to relate notable use by their students or themselves of other tools, such as MP3 players, iPads, or iPods. This scarcity of evidence of use of Mobile Learning tools further confirms the fact that their conception of Mobile Learning was shallow and heavily influenced by their already existing conceptions of online learning. When prompted further, the participants agreed that there were some constraints on the use of those tools. One participant clearly explained her reason during the interview.

> *I agree with you. Now there are also iPads and iPods. We can easily use them as learning tools. I have an iPad and iPod. But, I only use them for myself, not for conducting the course. I think I use my iPad when I log into my Facebook account. Some of my students are my Facebook friends. I noticed they like to comment, and once in a while, they talk about the course. But, not many do this. They prefer to usethe i-Learn portal because everybody has access to the portal. They are also being assessed based on the activities hosted on the i-Learn portal. I guess that's why many facilitators and students prefer the portal to using the iPad. After all, not everybody has an iPad (Participant 2)*

Participant 2's response indicates why the facilitators preferred to use the i-Learn portal in attempting to implement Mobile Learning despite the availability of similar functions on their iPads. Another reason is that not all facilitators own an iPad. This may be because the 'iPad and iPod culture' is not yet a norm in the faculty, many of whom do not even own an MP3 player. However, many academics who own at least one of these gadgets still prefer to use technologies they have been using over the last decade, such as email and online materials viewable on a desktop or laptop browser, in conducting their courses. Hence, it seems safe to conclude that mobigogy has yet to be embraced by Malaysian academics.

Interestingly, although the participants likely lacked the relevant theoretical concepts relating to adult learners (covered above), they were aware of the unique characteristics of the adult learners they taught in the programme compared to regular university students. All four respondents spoke of the adult learners as mature and motivated. The following excerpts are evident of their awareness of adult learners as a distinct group.

> *They are a special group of students. Unlike the younger students I teach, this group is more talkative because they are less shy. They are also more interested in studying. The class discussions are always interesting, as they can really talk in the class.(Participant 1)*

> *They are older [than the other] students I teach. Being older, they have a different style of learning. They like discussions and they like to challenge each other's opinion. (Participant 2)*

> *The adult learners are those who are working but need to continue their studies, a highly motivated group of students. In my class, they are not shy and are very mature. Sometimes, I feel weird, as I am younger than them…. (Participant 3)*

> *They are mature and very talkative. In my online group discussions, too, they would ask me and their classmates questions (Participant 4)*

However, the participants are young academics who have less than five years of teaching experience; their responses highlight the possible need for training in andragogy. They are aware that the science and art of teaching adults differs from that of teaching young people, but they have yet to come to understand the best teaching strategies for teaching adults. The following excerpts provide relevant data.

> *Yes, I am excited teaching them…they are interesting people. But, sometimes, I feel challenged because I have not been [teaching] in school like them. So, when we discuss certain things, I am not sure how to make them talk about their schools and students. If they do, I don't know whether what I responded with was good. Am I teaching them right? I ask that question sometimes (Participant 2)*

> *Sometimes, I feel weird, as I am younger than them. I know my subject matter quite well. I can talk about the topic. But, I am not sure whether my teaching style is suitable for them, because they are older than I. I do not know what they have gone through or experienced. Oh dear, I always have questions on what to do to make my sessions effective for them. What is it ya[a Malay grammatical particle indicating a request for confirmation]?…. Andragogy, right? (Participant 3)*

These responses indicate a need among participants for exposure to the idea of andragogy. They need to know how to relate to their adult learners' experiences and provide the right feedback. The participants felt a bit uncomfortable in class, as they are younger than most of their adult learners. This signals the need for greater confidence on their part when dealing with adult learners.

RQ 2: How do the participants incorporate Mobile Learning in their courses?

A set of interview questions were posed to the participants in order to discover how they incorporate Mobile Learning in their courses *(Considering them as adult learners, what are some activities which could be incorporated in Mobile Learning?)*. The answer to the second research question also relates to the participants' responses to the first research question, on their understanding of Mobile Learning. As presented in the previous section, participants' understanding and conception of Mobile Learning are quite shallow and seem to be influenced by their level of awareness of e-learning. They tend to consider Mobile Learning to simply be a form of e-learning, without knowing much about the tools and gadgets which can support Mobile Learning and open up new avenues for instruction. Mobile Learning to them basically

refers to when they are able to communicate easily with their students regardless of their location. The use of smartphones, for instance, is limited to the capability for quick reference to the internet on the facilitator's part. They did not attempt to encourage their adult learners to use mobile devices to access extra information.

In incorporating Mobile Learning in their courses, the participants felt that smartphones and laptops were essential to their learning and teaching process. The adult learners in their classes were encouraged to bring their own laptops to class and use them for certain activities, such as preparing for power point presentations or assignments and surfing the internet when needed. The use of laptops was supported by the wireless internet access available and the fact that many of the adult learners had their own broadband as sometimes they had difficulties with the university's server. The interview excerpt below provides a perspective.

> *Well, how do I incorporate Mobile Learning…. I suppose that is when I encourage my students to call or SMS me whenever they need. You know, it is true when people say that we lose our privacy when we give our phone numbers to students. They actually called me late at night and even very, very early in the morning. Anyway, since they are busy teachers I think my adult learners have to call me at odd hours. So, it's ok. (Participant 2)*

> *In my case, I like them to always search for extra information. They could even bring new information to the class or during our online discussions. Our online discussions are very active and interesting. I enjoy reading their comments. They comment on each other's opinions and provide extra help and support. I saw it in their online discussions. Being adults, they are helpful to each other, not competing to be the best but to help each other. (Participant 3)*

> *I don't have to ask them to bring laptops to class because they [already] take the trouble to bring the laptops and portable printers to class. I noticed they needed to finalise their group work or merge their parts of [a group] assignment into a complete draft of their assignment before submitting it to me. That is why they have laptops and printers with them. I like it too because I can ask them to surf the internet using their laptops. It is so easy with the adult learners because they are able to have their own broadband. Anyway, we also have Wi-Fi in the class. (Participant 4)*

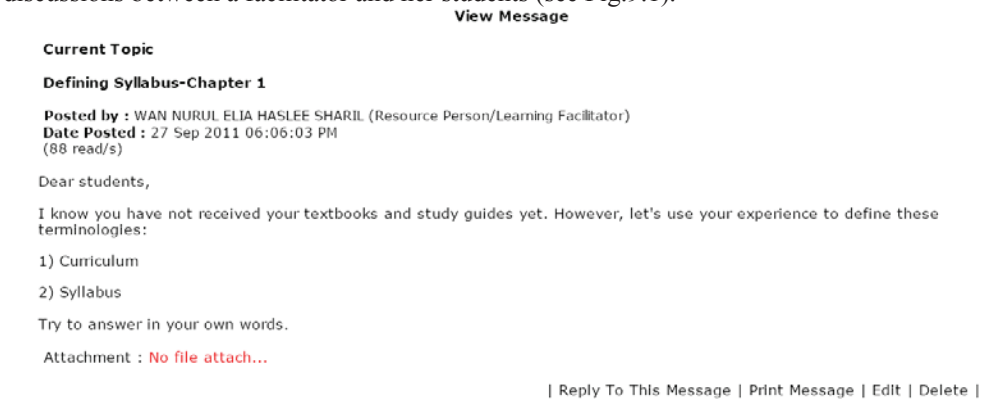
Sadly, when the participants used their laptops and printers for this purpose, it cannot really be seen as Mobile Learning. The laptops and printers were in fact used for practical reasons such as they needed to finalise their assignment and submit to the instructor on the day they had the class.

RQ. 3: How do the participants consider the characteristics of adult learners' in conducting their lessons via Mobile Learning?

It was very obvious from the interviews that all the participants were aware of the richness of their students' experiences. This is because the adult learners are in-service teachers who were taking a course on teaching methodology, allowing them to bring these rich perspectives to their

class work and express them in the classroom. As indicated in earlier discussion on the findings, the participants felt that they lacked experience of school teaching compared to their students. That explains why they were not sure how to relate to their students or provide feedback.

Nonetheless, the participants did from time to time encourage their adult learners to make use of their own experiences in the course. An example is taken from one of the online discussions between a facilitator and her students (see Fig.9.1).



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Current Topic

Defining Syllabus-Chapter 1

Posted by : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator)
Date Posted : 27 Sep 2011 06:06:03 PM
(88 read/s)

Dear students,

I know you have not received your textbooks and study guides yet. However, let's use your experience to define these terminologies:

1) Curriculum

2) Syllabus

Try to answer in your own words.

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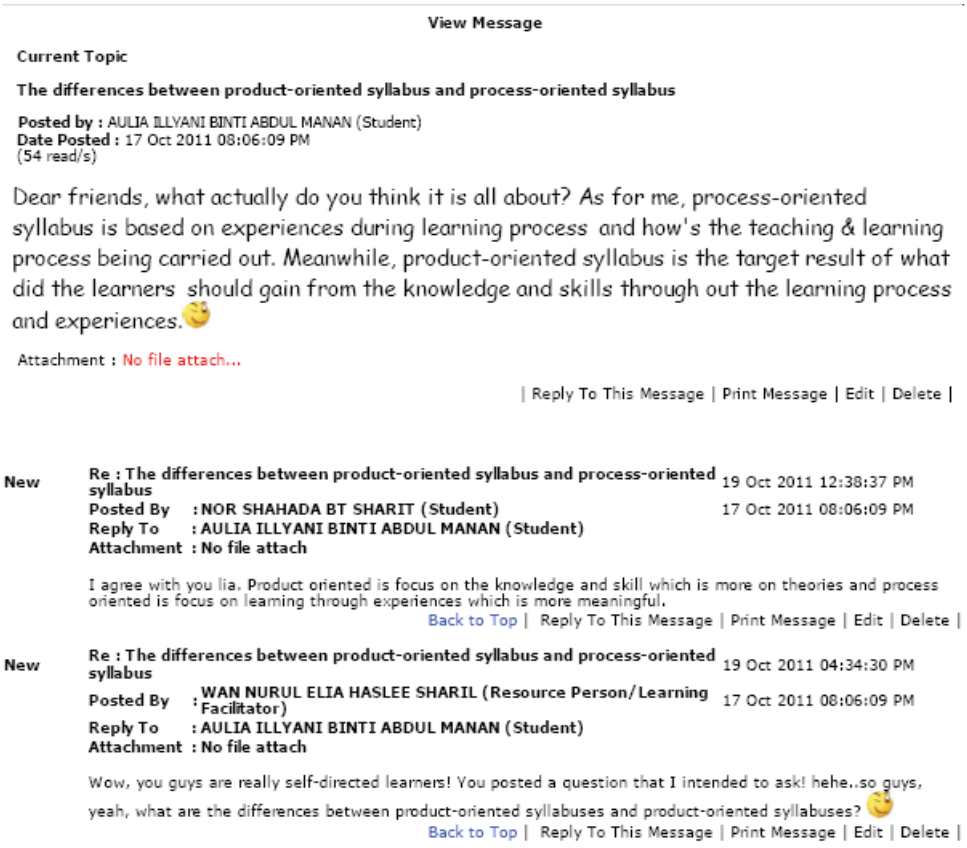
Figure 9.1: Online discussion encouraging the reference to students' experience

Knowing that the adult learners had yet to receive any reading materials, the facilitator had suggested that they refer to their own experiences to answer questions assigned in class. Her suggestion that learners refer to their own experiences was extended when she requested that they use their own words. Besides that, she also encouraged her students to comment on the topic/content of lessons and use their own experiences to support their arguments. In responding to this request, one of the adult learners had the following comments (Fig.9.2).

As a teacher, I admit that I can not focus on every single motivation. What I actually do is to generate motivation from my students by combining mutual interests (eg. what they aim for, what they expect) with dominant groups of interests (eg future career, language use target) in my syllabus. Munby seems to forget the fact that learners are human beings who can think, feel, sense, see, create and be tired. That is why in his model, learners are seen as more passive and machine-like beings, who either productively or receptively are pressured by so many artificial factors raised by Munby. As Munby thinks, learners only need but do not want. It is far from the truth. What I have observed so far in language classes proves that 'wants' play a decisive role in mastering a language although 'needs' play a key role in learning it.

Figure 9.2: Sample of a student's attempt to use her own experience

Finally, the participants also talked about the need for self-directed learning among their adult learners when they responded to one of the interview questions (*How do you strategise your Mobile Learning sessions to suit adult learners' needs?*). In describing the characteristics of those learners, the participants agreed that adult learners need to be independent and initiate their own efforts to access and assimilate new information. The following thread of communication (see Fig. 9.3) among the students and the facilitator shows their ability to engage in self-directed learning and encourage each other in this regard.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Current Topic

The differences between product-oriented syllabus and process-oriented syllabus

Posted by : AULIA ILLYANI BINTI ABDUL MANAN (Student)
Date Posted : 17 Oct 2011 08:06:09 PM
(54 read/s)

Dear friends, what actually do you think it is all about? As for me, process-oriented syllabus is based on experiences during learning process and how's the teaching & learning process being carried out. Meanwhile, product-oriented syllabus is the target result of what did the learners should gain from the knowledge and skills through out the learning process and experiences.

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New — Re : The differences between product-oriented syllabus and process-oriented syllabus — 19 Oct 2011 12:38:37 PM
Posted By : NOR SHAHADA BT SHARIT (Student) — 17 Oct 2011 08:06:09 PM
Reply To : AULIA ILLYANI BINTI ABDUL MANAN (Student)
Attachment : No file attach

I agree with you lia. Product oriented is focus on the knowledge and skill which is more on theories and process oriented is focus on learning through experiences which is more meaningful.

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New — Re : The differences between product-oriented syllabus and process-oriented syllabus — 19 Oct 2011 04:34:30 PM
Posted By : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator) — 17 Oct 2011 08:06:09 PM
Reply To : AULIA ILLYANI BINTI ABDUL MANAN (Student)
Attachment : No file attach

Wow, you guys are really self-directed learners! You posted a question that I intended to ask! hehe..so guys, yeah, what are the differences between product-oriented syllabuses and product-oriented syllabuses?

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Figure 9.3: Sample from online discussion on students' self-directed learning

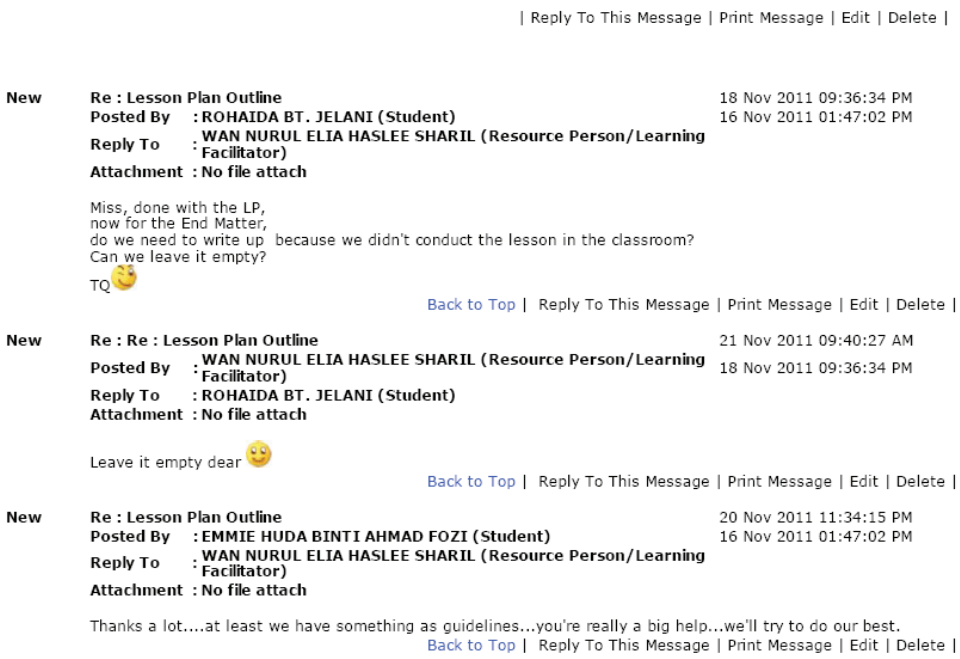
The feedback and comment provided by the facilitator suggest her approval of the adult learners' initiative. The praise she gives encourage them to be self-directed.

RQ 4: What challenges do the participants face when integrating Mobile Learning into their adult classes/sessions?

One interview question was posed to elicit relevant information from the participants *(Based on your experience, what are the common challenges in implementing Mobile Learning among adult learners?)*. Additionally, samples from the participants' online group discussions provided further evidence.

It has to be mentioned again that all the participants' understanding of Mobile Learning is heavily influenced by their understanding of e-learning. On top of that, when talking about their classroom materials and activities, the participants' responses were based on the use of smartphones, laptops, and the i-Learn portal. There was generally no mention of the use of MP3 players, iPads, or iPods except when participants were prompted. Hence, it must be clear that when they described their challenges, they were referring to the use of the former group of tools.

The first challenge the participants felt that they faced was a lack of higher-order thinking skills among their adult learners. The participants seemed to agree that they had higher expectations of their adult learners than they would have of younger students because they were in-service teachers who were expected to display some degree of higher-order thinking skills during online discussion. A sample taken from one of the communication threads between Participant 3 and her students provides the evidence (see Fig.9.4).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New — Re : Lesson Plan Outline — 18 Nov 2011 09:36:34 PM
Posted By : ROHAIDA BT. JELANI (Student) — 16 Nov 2011 01:47:02 PM
Reply To : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator)
Attachment : No file attach

Miss, done with the LP,
now for the End Matter,
do we need to write up because we didn't conduct the lesson in the classroom?
Can we leave it empty?
TQ

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New — Re : Re : Lesson Plan Outline — 21 Nov 2011 09:40:27 AM
Posted By : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator) — 18 Nov 2011 09:36:34 PM
Reply To : ROHAIDA BT. JELANI (Student)
Attachment : No file attach

Leave it empty dear

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New — Re : Lesson Plan Outline — 20 Nov 2011 11:34:15 PM
Posted By : EMMIE HUDA BINTI AHMAD FOZI (Student) — 16 Nov 2011 01:47:02 PM
Reply To : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator)
Attachment : No file attach

Thanks a lot....at least we have something as guidelines...you're really a big help...we'll try to do our best.

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Figure 9.4: Sample from the online discussion on the students' concern about assignment

From the sample, it can be seen that the student was concerned about completing the assignment in the way required by the lecturer. No effort seems to have been taken to evaluate the topic and content or synthesise new and old information. Additionally, it can be seen that no attempt was made by the student to question her facilitator; instead, she obediently agreed with the facilitator and said that the facilitator was a '…really big help'.

During the interview, Participant 3 said the following:

> *I was hoping they could ask me more challenging questions in our discussions. Just look at this example. You see, she only wanted my confirmation on the assignment outline. I thought she could ask me questions regarding the preparation of Lesson Plans and its importance or role…not just about the [formal requirements of the] assignment.*

Participant 3's opinion is supported by the other participants. Interestingly, one of the participants showed an SMS which she received from one of her adult learners, who apologised

for being absent from the executive seminar and hoped that the facilitator could elaborate on the assignment, which was based on in-class discussion. The participant said the following:

> *Why are they always bothered about assignments only? She missed the once-a-month-meeting. She sent me this SMS asking for clarification on the assignment. I feel angry sometimes. Can't they pose more interesting questions, especially when they miss classes?*

Another challenge faced by the participants was the perceived inability of their adult learners to personalise the discussion by using their own experiences as examples. The sample displayed in Figure 9.5 taken from the online discussion, provides an example.

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Current Topic

The Role of the Classroom Teacher

Posted by : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator)
Date Posted : 27 Sep 2011 06:10:11 PM
(152 read/s)

Dear students,

Let's try and discuss the following situation:

In a syllabus design context, what is the role of the teacher? Provide examples from your own practices

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New **Re : The Role of the Classroom Teacher** 27 Sep 2011 08:43:01 PM
Posted By : **ROHAIDA BT. JELANI (Student)** 27 Sep 2011 06:10:11 PM
Reply To : **WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator)**
Attachment : **No file attach**

I believe that a teacher is someone who becomes through many years of training and experiences in the field. I have not found a teacher who is an expert the first day of their profession. I believe that is urgent for everyone who is a teacher or is planning to become one to get prepare in the field the best they can. All teachers who get prepare will know how to set up rules in the classroom. Those kind of teachers will probably have less problems in their classroom because they will be able to control the classroom.

A teacher carries a big responsibility in her classroom. One reason is that all students depend on her/him. Everything the teacher sys will have an impact on the students. If the teacher feels joy of feels anger, it will be spread among children because the attitudes of the teacher gets contagious. If the teacher laughs, students also laugh, why? Because teachers are responsible for the social behavior in the classroom. If something goes wrong the only responsible is the teacher even if it was not their foul.tq

Figure 9.5: Sample from the online discussion on students' general answers

The participants agreed that not all their adult learners could actually bring their experiences into the group discussion. Many of them tended to give general answers without specific examples taken from their own workplace or setting. This was felt by the participants to be quite a shame as the adult learners were students in a methodology course and being in-service teachers, they could have provided interesting examples. The comment given by one of the participants provides a possible reason for this situation.

> *Yes they are very active…they comment and comment and give opinions on each other. But, they did not personalise their answers or comments. As teachers, the students could easily have talked about their own classrooms and students. I suppose they are shy to talk about themselves. It's funny because they are adults…and you know, they are far apart [on-line]. They don't see each other face-to-face. I thought being apart they [would be] freer to talk about themselves. (Participant 1)*

From this interview excerpt, it can be concluded that the participants felt that their adult learners were not using their special characteristics to their best advantage. Nor did the use of Mobile Learning have a positive effect, since although the adult learners were working from separate locations, they were still cautious about giving comments.

Another challenge mentioned was the adult learners' over-concern about textbooks and course materials. The following sample (see Fig. 9.6) from one of the online discussions provides evidence.

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New **Re : What's hot?** 20 Sep 2011 07:25:39 PM
Posted By : **ZALINA BT MUSTAPHA (Student)** 20 Sep 2011 03:54:12 PM
Reply To : **SYARIFAH SABIRA BT SYED BAHAROM (Student)**
Attachment : **No file attach**

we still did not get any references from the ined..the books or the notes from the support materials..

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New **Re : Re : What's hot?** 20 Sep 2011 10:15:55 PM
Posted By : **SITI SHARINAH BT ISHAK (Student)** 20 Sep 2011 07:25:39 PM
Reply To : **ZALINA BT MUSTAPHA (Student)**
Attachment : **No file attach**

just knew about the book that will used for this sem @ design syllabus from miss elia...and still waiting to get it from ined...

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New **Re : Re : Re : What's hot?** 21 Sep 2011 12:14:34 AM
Posted By : **SYARIFAH SABIRA BT SYED BAHAROM (Student)** 20 Sep 2011 10:15:55 PM
Reply To : **SITI SHARINAH BT ISHAK (Student)**
Attachment : **No file attach**

Oh....Hope we will get bundle of it soon!

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New **Re : Re : Re : Re : What's hot?** 21 Sep 2011 09:47:29 AM
Posted By : **HEBAT RAFIDAH BT MUHAMMAD NASIR (Student)** 21 Sep 2011 12:14:34 AM
Reply To : **SYARIFAH SABIRA BT SYED BAHAROM (Student)**
Attachment : **No file attach**

What if we still do not get the book until the Seminar 2. I have consider to buy it myself. But I didn't know where to get the book by myself. If you guys know where to buy the book..please inform m..ok..

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Figure 9.6: Sample from the online discussion on students' concern about textbook

The participants agreed that in a special programme like this, (adult) students need to be more independent and resourceful and need to be able to access relevant information instead of depending too much on textbooks and course materials. Relating this challenge to the concept of Mobile Learning, the participants agreed that their adult learners may lack awareness of their responsibilities as m-learners. The participants emphasised the lack of technological savvy among their adult learners. Although they may have laptops and broadband or even

smartphones, said the participants, the adult learners did not really use them to access relevant information from the internet. Participant 4 said,

> *They are very dependent on the textbook and my course materials. They panic if they don't have them in their hands. Sometimes, the younger students I teach are better, because they like to surf the internet. This group of older students don't like to spend time surfing. They prefer to be given everything, all ready. For example, I once mentioned an article which I found on the internet. Instead of Googling for it, the adult learners wanted me to give them a copy. How frustrating!*

The sample (see Fig. 9.7) from the online discussion shows that the adult learners were also depending on their classmates for the reading and course materials, and provides evidence of their concern with completing the assignments as opposed to internalising the new concepts or knowledge.

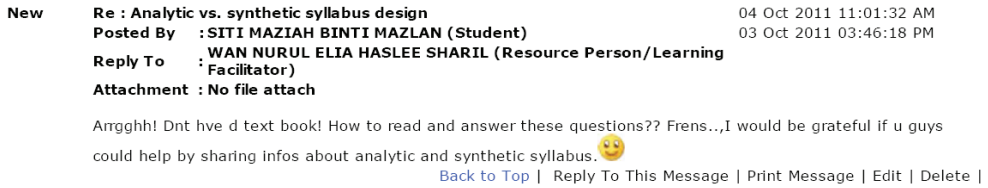
New Re : Analytic vs. synthetic syllabus design 04 Oct 2011 11:01:32 AM
Posted By : SITI MAZIAH BINTI MAZLAN (Student) 03 Oct 2011 03:46:18 PM
Reply To : WAN NURUL ELIA HASLEE SHARIL (Resource Person/Learning Facilitator)
Attachment : No file attach
Arrgghh! Dnt hve d text book! How to read and answer these questions?? Frens..,I would be grateful if u guys could help by sharing infos about analytic and synthetic syllabus.
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Figure 9.7: Sample from the online discussion on students' dependence on their classmates

Discussion

Several pertinent issues and areas which need further action can be identified from the findings of the study. The following list summarises the salient findings.

1) As the participants are young academics with less than five years of experience, their understanding of Mobile Learning and andragogy is still superficial.
2) With their shallow understanding of Mobile Learning and andragogy, the participants lack the resources and creative strategies to successfully implement Mobile Learning among adult learners, indicating a need for training in mobigogy.
3) To the participants, Mobile Learning is seen as similar to e-learning, with the exception of the accessibility to each other regardless of time and location that Mobile Learning allows.
4) Accessibility, to the participants, refers to ease of communication with their students and the students' ability to download materials uploaded by the teacher or facilitator.
5) Although the participants are aware of the availability of mobile devices, they are more comfortable using technologies which they have been using over the last decade, such as emails and online materials viewable on a desktop or laptop browser.

6) The participants felt that the greatest challenges in teaching their students as adult learners and their major areas of concern were giving effective responses/feedback and ensuring that their materials meaningfully supported learning.
7) The adult learners were not able to fully maximise their potential as adults and in-service teachers, as they were not able to display higher-order thinking or relate class concepts to their own workplace.
8) Both the participants (facilitators) and the adult learners may lack 'technology literacy' when conducting and following activities such as online discussions and surfing the internet for relevant information.

From this list, it can be deduced that when Mobile Learning is said to be expanding in higher education institutes; this may not be as it seems. In other words, lecturers who claim to be implementing m-learning may not really be doing so, but instead essentially be implementing e-learning, as indicated above. There have been many studies on conceptions of teaching held by instructors that reveal that lecturers do not always actually implement what they claim they do (Borg, 2003; Devlin, 2006; Faizah, 2012). As Mobile Learning is fairly new to the academy, it may be a similar case, indicating the need for training in mobigogy.

An alarming issue is the fact that many academics are not fully aware of the needs of the adult learners they teach or of the principles of andragogy. Faculty administrators, for instance, need to ensure that the relevant staffsare competent to conduct courses for adult learners. Exposure to andragogy and related teaching strategies seems to be an important element in any professional development training for young academics (Faizah, et al, 2012). A clear understanding of adult learners and their characteristics can further assist academics in preparing and conducting their classes—in this case, in implementing Mobile Learning.

Finally, there is also a major need for training on technology literacy. This training is far more important for instructors than for students, as the instructors need to be technology literate before they can guide their students to be so as well. The findings from the study had indicated the lack of awareness of the variety of tools which can support Mobile Learning among the participants. They also seemed to need more exposure on the creativity in applying their preferred tools (smartphones and laptops) to the fullest in an Mobile Learning context.

Conclusion

This case study has examined the potential of Mobile Learning for a group of adult learners by investigating selected participants' perceptions of Mobile Learning and their students' characteristics as adult learners. Mobile Learning has great potential, and the participants have all claimed to be implementing it. Nonetheless, the quality of their implementation was heavily impacted by their understanding of Mobile Learning and the needs of adult learners.

The findings of this study and their implications lead to the following proposals for further measures. First, future research should be conducted on similar participants in different settings. Additionally, the potential of a quantitative research design in examining similar issue should be explored. Immediate measures should be taken to implement and improve training for instructors on adult learners (andragogy), Mobile Learning (mobigogy), and technology

literacy. Attempts should also be made to ascertain whether academics are implementing exactly what they claim they are with regard to these practices. Finally, on-going support from relevant experts, including coaching and mentoring for young academics attempting to implement innovative practices such as Mobile Learning, should be put into place.

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{ Chapter Ten }

An Exploration of the Mobile Learning Environment to Support Teacher Training

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Introduction

The mobile phone is a common communication tool for young adults. Colley and Stead (2003) noted this in their study of 16- to 24-year-olds. Further, compared to a laptop, a phone is a relatively inexpensive piece of hardware. The literature on digital learners has also supported the notion that higher education (HE) students are well equipped with and extensively use mobile phones (Bennett, Maton, & Kervin, 2008; Bullen *et al.*, 2009; Jones & Cross, 2009). It is common for Malaysian students in higher education institutions (HEI) to own a mobile phone — a trend that is likewise observed in other countries. Mobile phones have the potential of being integrated into students' learning because their 'technologies are familiar, personal, universal, non-intrusive, lightweight and cheap, to be woven into every waking moment, among a myriad of other activities and in all manner of social settings and groups' (Traxler, 2008, p. 18). In other words, the mobile phone truly encompasses the notion of learning anytime and anywhere, in contrast to E-learning, which is still tied to the desktop PC. The question now is whether HE teacher trainees in Malaysia would be able to accept learning that is supported by their mobile devices.

In most HEIs in Malaysia, the delivery mechanism for a course is usually the face-to-face classroom set-up, blended with an E-learning platform to complement the topic being studied. Institutions normally provide their lecturers with a standardised Learning Management System (LMS), where they place their notes, PowerPoint presentations, or additional support (for the more adventurous), such as discussion forums, learning objects, etc. If we are to embrace the potential of the mobile phones, there needs to be a study on the prospect of providing another platform for HE students to ensure that their learning is supported outside the classroom. Noting the potential of the mobile phone as an additional tool for learning, we have embarked on this exploratory study, which aims to investigate the possibilities of utilising the features and activities offered by the device to provide supplementary learning activities for HEI students.

It is the vision of the Ministry of Education (MOE) of Malaysia to put forth information and communications technology (ICT) as a central concept in transforming the educational system — a vision that will fail if teachers are not ready to embrace the current technology in delivering their daily lessons. Bakar and Mohamed (2008) illustrated the importance of exposing future teachers to such technology, thereby boosting their competence and confidence in using the technology in the classroom. Bakar and Mohamed proposed that 'teacher education students must be given the opportunities and experience to integrate ICT in teaching' (p. 7), and the most propitious time for it is during their higher education.

In this case study, we investigated the possibility of using the mobile phone to complement the students' learning. The selected course is an introduction to Technology in Primary Education (PKEY3101) for 73 students of Bachelor of Education of English as a Second Language (TESL), in the Faculty of Education, University of Malaya. The participants are in third year and are selected to teach in primary schools. The course will earn the students three credits. The focus of this study is to gauge whether these students are able to embrace the concept of Mobile Learning by first understanding how they use their mobile phones. This research aims to propose how the Mobile Learning concept can be introduced to teacher training in HEIs.

Potential of Mobile Learning in Teacher Training Higher Education

There are many examples of learning situations for HE students in-between pockets of empty time. Some of these initiatives are gathered through studies such as the Molenet (http://www.molenet.org.uk/) project and Learning2Go (http://www.learning2go.org/) Wolverhampton project. Possible Mobile Learning activities include listening to audio lectures while waiting for the next class, reading small-bite notes while on the bus home, receiving email or SMS (short messaging system) feedback, sending a question to the tutor while waiting for Internet downtime, or videotaping on the spur of a moment of reflection while waiting for a friend in a café. Some of these activities indicate that Mobile Learning does not necessarily have to be connected to a network, as some have assumed. Reading an eBook, listening to a podcast, or even making notes about a thought could be learning activities that do not require connection at that particular time. The attractiveness of Mobile Learning is the capability to engage in learning while taking into consideration the mobility of the learner, the context that he or she is in, and the just-in-time aspect of a situation.

No doubt, there are many challenges facing Mobile Learning, especially technical issues such as the small display size and resolution; small key-in size; short battery life; limited performance due to storage, memory, and processor size; and different browser standards and operating platforms in various devices. Moreover, a cross-platform solution is still at its infancy. There are also other issues, such as cost, since mobile communication is still expensive for students, particularly connection to the Internet. However, we do know of the continuous, expeditious effort to evolve smaller, 'smarter', and cheaper devices.

Saedah Siraj (2004) foresaw the eventual inclusion of Mobile Learning in the Malaysian curriculum, and proposed that Malaysian teachers be exposed to and trained in it early on. There are viable possibilities for HE students, specifically teacher trainees, to embrace and

engage in this type of learning; below is a list of Mobile Learning characteristics made by Leung and Chan (2003, p.3), to which we have added our reflections.

- *Dynamic*. It provides current content; online experts and resources are readily available in websites such as Wikipedia. Teacher trainees could also Google anything on the Internet to understand concepts better.
- *Operates in real time*. Teacher trainees could receive just-in-time information whenever they need it (for example, in the middle of a group discussion).
- *Collaborative*. People learn from each other. Teacher trainees can always be connected — with each other, their peers, tutors, or other experts.
- *Individual*. Teacher trainees can choose the activity that suits their needs at any given time (for example, listening to a podcast or reading an eBook).
- *Comprehensive*. Teacher trainees are given suitable options that provide 'learning events from many sources', be they static resources such as an information page or the more dynamic ones, such as discussion forums.
- *Builds learning communities*. The groups could be formally or informally established. Teacher trainees are connected in their community of practice within the scope of their course or even out of it. The former are their peers and course tutors, while the latter are experts or various other communities that the students belong to.

Taking into consideration these Mobile Learning characteristics, an active learning experience could be designed within the framework of a HEI teacher training course which provides empowerment and engagement for future teachers. Klopfer, Squire, and Jenkins (2002) have descriptions that are similar to the list of Leung and Chan (2003), but with added context sensitivity properties. According to them, Mobile Learning makes situated learning possible in a wider variety of locations and across time, thus increasing the potential synergies of ideas. An understanding of these characteristics would enable the creation of learning activities for teacher trainees in a HEI that can further support the course.

One great advantage of Mobile Learning is that the day-to-day commitments of learners do not have to be interrupted or sacrificed. Thus, Mobile Learning allows HEI teacher trainees more autonomy and flexibility. They are able to key in their thoughts immediately. Ally and Kroeker (2005) noted this advantage, stating that 'creativity can be captured when it flashes into existence; often not when the learner is sitting at the work station. The real-time nature of thoughts is such that our best ideas may arise when we are least equipped to record, expand, and communicate them" (p.187). In other words, the attraction of Mobile Learning is that HEI teacher trainees can access information anytime and create at their own pace, and therein lie a great many possibilities for creating the space HEI teacher trainees need to further comprehend or reflect on a certain subject or topic.

Research Strategy

The case study method was chosen in order to extract rich findings that would help us understand how the mobile phone can be used as a learning tool. This method allows the exploration of

the Mobile Learning environment in its natural setting (Bassye, 1999; Benbasat, Goldstein, & Mead, 1987; Merriam, 1988; Stake, 1995). The case method also enables us to answer the 'how' and 'what' questions, thus helping us grasp the nature and the complexity of the intended learning environment (Yin, 1994, p.1). By concentrating on a single phenomenon (in this case, a class studies using mobile phones), it is possible to uncover the interactions of significant elements (Merriam, 1988; Stake, 1995). Hence, even a single case study can attain the goal of understanding the use of mobile phones for learning.

Since Mobile Learning is a rather new phenomenon, it is proposed in this case study that besides conducting a needs analysis of the students, it is also essential to provide an exposure workshop. A virtual support group is also needed as students begin to experiment and experience Mobile Learning activities. Figure 10.1 shows the proposed structure of an introductory course to the Mobile Learning initiative.

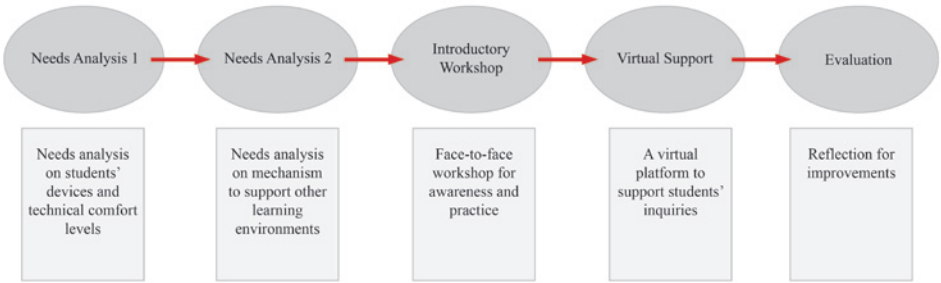

Figure 10.1: Implementation Plan for Mobile Learning Introductory Practice

Two needs analyses were conducted: one on the students and the other, on their virtual learning environment. The first analysis is supported by Anarki (2007), who emphasised the importance of 'assessments on the needs and requirements of students in using mobile device' (p. 291). The second is also essential because in this study, Mobile Learning is supposed to support existing learning mechanisms, such as the face-to-face and web-based delivery mechanism; we need to determine how best to fit Mobile Learning activities in the context of the course. The data gathering for this preliminary study on the possibility of providing an alternative learning environment for teacher trainees involved the following:

- A questionnaire was distributed early in the course to investigate the type of mobile device being used by the teacher trainees, and their comfort level in the tools and functions of the mobile device and other web tools. The questionnaire was also used to gauge how the teacher trainees perceived the introduction of Mobile Learning, especially their preferred activities, to support learning through their mobile phone.
- A Mobile Learning workshop was delivered during the three-hour face-to-face class. In the workshop, the teacher trainees were given examples of various applications of Mobile Learning activities. For instance, an SMS blast was used in reminding them of the event. They were also requested to try out a few applications (e.g. Poll Everywhere) as live feedback mechanisms in class. The teacher trainees were shown how to create an MP3 audio file, which they can download into their mobile phones to listen. After the Mobile Learning workshop, they were asked to add to their reflective

blogs their opinions about the potential of Mobile Learning activities. The individual blogs were created at the beginning of the course as an assignment. The reflections that they posted were analysed for their perception on the use of Mobile Learning as a support platform for their own studies.

Findings

The paper-based Mobile readiness questionnaire was distributed to all students during a face-to-face class and collected as soon as they were filled out; 70 questionnaires (64.3%) were collected.

We were informed that only one student did not have at least one mobile phone; 30% had more than one. Most of the participants were familiar with their phones. However, quite a number of them had web-enabled phones (64.3%), though they rarely used this feature due to the cost. All except one declared that they did not mind giving their private mobile phone numbers to their lecturers or education institution for the purpose of their course, probably since educational institutions often ask for contact numbers anyway.

The results of the questionnaire showed that the participants used their mobile phones mostly to make and receive calls (97.1%), send and receive SMS (95.7%), and use the phone calendar (72.9%). They also indicated that the most beneficial Mobile Learning activities — receiving notices about their course through SMS (67.1%), capturing videos or pictures for their assignments (57.1%), and sending questions through SMS (50%) — should be offered through their mobile phones. In tandem with the Sharples, Chan, Rudman, and Bull (2003) research initiative, we predict the continued popularity of SMS and schedule alerts despite their having been made available through the Web; these are mobile organisation and communication tools that are likely to be important for the teacher trainees in managing their learning.

After the Mobile Learning workshop, the concept of using their own mobile phones to support their own learning seemed like a novelty for the teacher trainees. Judging by their blog posts, it was only after trying some applications suggested in the workshop that they began to absorb the idea. A couple of examples:

> *I have tried Facebook Mobile in my handphone and I loved it! With this, it is like having your laptop in your handphone (AAR)*
> *Learning is no longer visual only; it can be varied and vast! (CT)*

Interestingly, some teacher trainees said that they had already been using their phones for learning, but only became aware of it after the Mobile Learning workshop. Some of their statements:

> *I can make a call and send SMS; I can also use the phone's alarm to wake me up and I can save several notes in the phone. (AFR)*
> *As I reflect on being a university student, I realise that I actually have experienced Mobile Learning all this time — without realising this was what it was called! When I bought my current N70 phone, I had requested that it be*

installed with a PDF reader and Word reader so I could read PDF and Word files in my phone. (IY)
From my experience in using mobile gadgets, I find them very useful in making my life easier. As I said just now, we can use them anywhere and anytime. They are quite easy to use and carry. (AFA)
As for my small-tiny-mini NOKIA 6288, I once used the recorder to record my ugly voice and listen to it over and over again, just to remember certain facts well. (exam time?) (ALCK)
I did Mobile Learning before, when I didn't even know what Mobile Learning was. That was when I had my brother's iPhone to bring along wherever I went. I installed Wikipedia and even stored Assessment notes in the phone. Why? Because the lecturer liked to test us whenever he felt like it and I wanted to be ready. Did that help me? Yes, a great deal. (LCWY)

Arguably, Mobile Learning could be implemented in a HEI teacher training course, although a few issues have to be considered for its acceptance. Firstly, the concept will need to be introduced to the teacher trainees, and a virtual technical forum has to be created to help them to get to know their mobile phones better. Mobile Learning activities that are expected to get the green light are those which allow teacher trainees to receive information with minimal use of web-based connection. Learning objects, whether in audio or visual format, could be downloaded from or uploaded to the phone via a PC, rather than doing so directly to the phone using its web-based connection. However, we have to remember that we are still in the preliminary stage; a full-blown implementation of the concept is needed to accurately assess the teacher trainees' acceptance of carefully planned Mobile Learning activities.

Conclusion

The outcome of this exploratory study can be used as the basis for designing instruction that would complement face-to-face classes and the E-learning platform. The fact that almost all HE students own a mobile phone makes the device the natural choice for getting the teacher trainees connected; the opportunity to deliver just-in-time content is also a great possibility. This study shows that HE teacher trainees are open to Mobile Learning to support their learning, but there are many challenges that a course tutor needs to pound and ponder to be able to implement this initiative. A crucial one is capitalising on the flexibility and freedom afforded by mobile phones, and new pedagogies and approaches are thus very much needed to facilitate the course instruction. There is also a need to design learning activities that will build new learning processes via the mobile device while complementing the existing technologies with which HEI students are familiar.

It appears that a wide range of learning activities exist that could be supported by mobile digital tools and environments which hone the necessary skills of a 21st century HE student. Such skills are especially important to the participants of this study, as they are future teachers who would need to equip their own students for a more digitised future. Thus, if these teachers-to-be were ready to embrace Mobile Learning, they would, in turn, be more aware of possibilities that it could offer to their students-to-be. This is being echoed in the proposed structures of

ICT integration in teacher training, such as the framework suggested by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) – Asia and Pacific Regional Bureau for Education in Bangkok. The proposed framework was initially designed by UNESCO Bangkok (2005) as the basic framework for an ICT in Education Toolkit for policymakers and planners.

We have amended this framework to accommodate Mobile Learning activities, as depicted in Figure 10.2.

Based on Usage		**Based on Delivery Medium (Mobile Learning)**
Specialising in the use of ICT	**Transforming**	Producing content by using Mobile Learning tools and applying to pedagogy
Understanding how and when to use ICT	**Infusing**	Using Mobile Learning tools for teaching and learning purposes
Learning how to use ICT	**Applying**	Learning to use Mobile Learning tools
Becoming aware of ICT	**Emerging**	Becoming aware of Mobile Learning concepts, tools, and pedagogy

Figure 10.2: Mapping Teaching and Learning to the Stages of ICT Implementation

In mapping Mobile Learning activities to support teacher training, we believe that there should be an awareness stage before the teacher trainees could learn the suggested software or applications. The next stage is for the teacher trainees to use these tools as part of their lesson delivery, in tandem with the objectives in the syllabus. We further believe that if teachers are familiar — and therefore comfortable — with the mobile devices, they could use them to produce content that will support their or even their students' learning.

Through this study, we have found that HEI teacher trainees want to use their mobile phones to access their course content as regards the administration of the course or course notes, but emphasise the need to take a second look at the issue of cost. In another study of a pilot Mobile Learning project conducted in the University of Helsinki, the cost being borne by the students was also a major challenge (Seppala, Sariola, & Knaslathi, 2002). The access to course content could provide additional content which is created specifically for the students' mobile phones, such as small quizzes or notes to refresh the knowledge of key concepts. The challenge for any HEI course is to develop didactic environments for mobile devices in order to integrate them into the course learning strategies. It is important that teacher trainees choose and experience appropriate tools and applications, and investigate the benefits and effectiveness of embracing Mobile Learning.

The Malaysian policy concerning ICT in education, which is transmitted through the Education Development Plan (2001-2010), is that all teachers should be given the skills and knowledge to use ICT effectively in their teaching. Although Mobile Learning is a rather new concept in the country, it is predicted that, with the rapid evolution of mobile devices, it will not

be long before this type of mobile and flexible learning will creep into our education system. Hence, teachers in schools or educators in HEIs, particularly those who train future teachers, will have to discover new ways in which the functionality of the device can be applied to support learning, in order to create new pathways that are more situated, personal, collaborative, and long-term

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{ Chapter Eleven }

Mobile Learning Development & Evaluation Framework for a Performance-based Environment in TVET

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Introduction

The notion of incorporating technology in education is in line with one of the Ministry of Higher Education's (MOHE) goals for the internationalisation of higher education (Sirat & Omar, 2008). To ensure the standard and quality of education, teaching, and learning at the tertiary level, all higher education curricula are monitored for adherence to the regulations established by the Malaysian Qualification Agency (MQA). In addition, all curricula are based on the Malaysian Qualifications Framework (MQF), which requires all institutions of higher education to utilize the MQA's Outcome Based Education (OBE) in developing their curricula. In January 2010, MOHE announced that the curricula of all polytechnics were to be restructured so as to adhere to OBE (Aspalilla & Nin Hayati, 2010; Joan, Pang, & Vitales, 2011). However, the implementation of OBE provides challenges not only in the construction of curriculum, but across the organization, systems, processes, beliefs, and philosophy regarding the principles of OBE (Joan, *et al*., 2011).

In order to produce skilled, flexible, and easily trained manpower, trainees or students must be able to adapt to technological change (Ahmad, 2005). Not only students but also trainers and teachers should be encouraged to vary their educational approaches and to avoid limiting their practice to only traditional methods of instruction. A survey conducted by the researchers found that at one polytechnic, students accepted any inputs from their instructors and carried out all the exercises and assignments given to them. These results made it clear that the teachers at that polytechnic were still employing teacher-centred learning methods that use demonstrations or demonstration methods in teaching Computer-Aided Design (CAD).

AutoCAD is a rather difficult course that requires some time to master; it requires a sense of curiosity as well as an ability to solve problems, to make decisions, and to engage in critical as well as creative thinking (Sidek & Mohd Ariffin, 2011). Technology can improve motivation (Holzinger, 1997), but even more importantly, it can affect the delivery of learning; delivery methods must be effective if they are to improve the problem-solving process (Sharples, 2000; Sharples, Corlett, & Westmancott, 2002). Failure among AutoCAD students is due mainly to a failure to understand and grasp the course's concepts (Sidek & Anoar, 2010). In addition, students studying CAD have reported that the factor that causes them the greatest difficulty in a higher education course is not absence from class but rather a lack of familiarity with software functions. They found that the most difficult aspects of learning CAD were the development of a clear understanding of the information and the production of three-dimensional objects from two-dimensional paper models (James, Diane, & Claude, 2007; Pérez Carrión & Serrano, 1998).

Through an identification of students' learning styles, one can determine the appropriate learning strategies that should be applied to teaching and learning (Honey & Mumford, 2000; Riding & Sadler-Smith, 1997). Earlier studies that administered a set of Honey and Mumford learning styles questionnaires to 60 students at the polytechnic in Kedah determined that the learning styles of polytechnic students fall predominately into the activist domain (47%) and the theorist domain (32%). Course materials based on students' learning styles are instrumental in producing effective learning (Lu, Yu, & Liu, 2003). Thus, the application of inappropriate learning materials contributes to students' difficulties in understanding and solving difficult problems in CAD courses. These issues have indirectly limited the ability of students to communicate and access information (Magoulas, Papanikolaou, & Grigoriadou, 2003) when they engage in independent learning.

In contrast to independent learning, collaborative learning is a method that can help improve interaction and discussion between teachers and students as well as between students (Seppala & Alamaki, 2002). Students must understand the learning concepts at hand before they are able to solve problems, manipulate existing problems, find and choose the right methods for solving problems, or even consider how a problem might be solved (Kim, Kolko, & Greer, 2002; Newell & Simon, 1972). Engineering education must shift from the traditional method of teacher-centred learning to one of student-centred learning in order to provide a successful experience for all learners (Duffy & Bowe, 2010). ICT is a medium that can be used to improve the process of interaction for and between students, as it has revolutionized learning environments throughout the world (Saadiah, 2003). Therefore, it is crucial that performance-based Mobile Learning be implemented in order to ensure that the quality of teaching and learning will benefit students; at the same time, this implementation will contribute to the development of diverse, alternative methods for improving student performance in technical and vocational education (TVE) in Malaysia.

Literature Review

Mobile Learning

Mobile Learning is a fairly new development that has emerged from the rapid advancement of technology; it holds the potential to help improve the quality of education in Malaysia. Mobile Learning is triggered by a combination of E-learning and mobile computers that provide application support for learning that can be done 'anytime' and 'anywhere' (Tatar, Roschelle, Vahey, & Penuel, 2003).

Mobile Learning is expected to increase the capacity for applied learning, especially for the purpose of delivering instruction. Mobile Learning can improve the quality of learning activities (Roschelle, Rafanan, Estrella, Nussbaum, & Claro, 2010; Zurita & Nussbaum, 2007). In addition, it is also capable of assisting the process of note taking and of delivering presentation support materials (Anderson, Simon, Wolfman, VanDeGrift, & Yasuhara, 2004; Kam *et al*., 2005), formative assessment materials (Cortez, Nussbaum, Woywood, & Aravena, 2009; Valdivia & Nussbaum, 2009), games (Spikol & Milrad, 2008), and simulations (Yin, Ogata, & Yano, 2007), and it can also be used to facilitate the problem-solving process (Looi & Chen, 2010; Nussbaum *et al*., 2009). The process has been shown to be very effective and has had a significant impact on the development of education in Malaysia.

Because research has shown that effective teaching and learning require a variety of methods and approaches to prepare trained employees, TVE also applies non-formal training in addition to formal sessions (Tessaring & Wannan, 2010). But learning that takes place lies deep in the policy, which is not concerned with student understanding—thus, its tendency to turn out students who are not mastering the skills that they have been taught. The execution of performance-based Mobile Learning is vital to ensuring high-quality teaching and learning that will benefit students and provide diverse alternative methods to improve general student performance in TVE in Malaysia.

Framework for Development & Evaluation

The development of Mobile Learning is a process that requires planning and that must meet the needs and potential uses of its learning materials and platform. To ensure that Mobile Learning materials are developed with high and reliable quality, a detailed and systematic planning process should be undertaken, as explained in the applicable framework for development and evaluation.

In this study, the researchers used the ADDIE model to guide the development of the production design of Mobile Learning instruction. This model has five main stages: analysis, design, development, implementation, and evaluation. Skill in determining content, the authoring program, and a systematic instructional design are the model's key requirements (Heines & Becker, 2010; Sampath & Quaine, 1990).

In the second stage of development, the researchers will design a mobile-learning prototype based on performance and problem-solving elements combined with navigation, menus, learning activities, and learning objects. In this phase, behaviourist, cognitive, and

constructivist theories will be applied to ensure that the prototype is able to solve problems and to improve performance. In the third stage of development, the researchers will create the mobile-learning prototype based on these elements.

In the fourth stage—implementation of materials—the researchers will evaluate the materials through alpha and beta tests before conducting the actual instruction. Alpha testing involves confirming that the course content is relevant to CAD experts and employs ICT elements. Beta testing refers to evaluation by students of equal abilities who are taking CAD courses at the polytechnic level. The learning strategies, content, navigation, and the mobile prototype learning instruction will also be evaluated.

Upon completion of the development phase, the researchers will evaluate the effectiveness of the newly created Mobile Learning materials. In the evaluation stage, the researchers will perform an assessment based on a quasi-experimental design. In the quasi-experiment, two classes were selected to conduct an assessment of the effectiveness of the prototype learning as it related to student performance, information management, and problem solving. The design of the pre-post test is very similar to the true experimental design; the quasi-experimental design differs from these. The groups of respondents were not created through a random selection procedure, and a random allocation procedure was not undertaken (Chua, 2006).

An experimental study is a study conducted to determine the effects of a treatment. Researchers deliberately and systematically apply identified variables to the subject and observe their effect. The evaluation stage serves to determine the effectiveness of Mobile Learning that uses independent learning strategies and collaborative learning strategies.

Performance-based Learning

Performance-based Learning is learning which consists of 3 Cs: *Competence*, *Cost*, and *Cause and Effect* (Gery, 1991). *Competence* is the ability to provide learning quickly; it is the process of turning a novice student into a trained student in a short period of time. *Cost* refers to the reduction in the cost of providing the learning process, learning materials, and training. *Cause and Effect* refers to the quality of products produced after a process of teaching and learning.

Performance-based Learning is a learning model that can improve student performance. Most instructors focus on how to convey information but do not extend that focus to student performance (Pfeffer & Sutton, 1999). In order to improve student performance, a performance-based model will be considered for the development of Mobile Learning instruction. The performance-based model is suitable for the application of ICT as an innovation in teaching and learning.

Methodology

In order to design Mobile Learning, researchers must understand its elements. Therefore, they need a framework that can serve as a guideline for the development and evaluation phases of their design process. Based on their instructional design, every development and evaluation phase has its own model and theory that must be considered to ensure that the resultant learning

materials are achieving their goals. For the purposes of this study, the researchers will focus on design development and evaluation for Mobile Learning. The researchers will combine both phases in one framework.

The first phase of the framework will focus on the development process. The researchers will illustrate the elements that must be incorporated according to the selected model. The development model will work as a track or sequence that must be followed in the design of the learning material. In this phase, the researchers will also ensure that learning theories are included as part of the design process and are utilized in planning the learning activities. It is expected that the inclusion of Performance-based Learning will significantly impact the respondents; the evaluation phase will determine the extent of this impact.

In this phase, the researchers will use a quasi-experimental design to evaluate the Mobile Learning prototype. For this experiment design, the researchers will select two AutoCAD classes which will be labelled 'Group One' and 'Group Two'. The advantage of conducting research using this design is that the researchers will be able to protect the groups from internal bias but will use the actual setting of respondents in the group.

This study will include interventions for both groups, which will continue to learn using a traditional teaching approach but which will also use Mobile Learning. The differences in the evaluation of the two groups will lie in their pre-test and post-test, as Group One will use a self-directed learning strategy while Group Two will use collaborative learning. Accordingly, the researchers will create different questions and approaches for administering the tests to the two groups. Students in Group One will take the test individually, while those in Group Two will take it in pairs. To ensure that there is no bias in the tests, experts will validate them before the actual field test begins. In addition, both groups will complete a questionnaire about whether Mobile Learning assisted them in solving AutoCAD problems and/or helped them to manage information easily.

Findings

This framework for the design and development of a Mobile Learning prototype for technical and vocational education and training (TVET) includes two phases.

Analysis Phase

To produce effective performance-based Mobile Learning materials, emphasis is placed on the following items:

a) Determine appropriate learning strategies that meet the needs of polytechnic students; determine appropriate strategies based on student needs;
b) Determine which learning style is dominant among students in order to establish appropriate methods for improving student performance; and
c) Ensure that students are prepared to use Mobile Learning applications.

Design Phase

In designing the Mobile Learning prototype, the following factors should be emphasised:

a) Designing the navigation process; determining how to connect the elements in the Mobile Learning prototype;
b) Designing the prototype's menu creation process;
c) Designing appropriate activities based on student needs; and
d) Designing appropriate learning objects based on student needs.

Development Phase

This phase emphasizes four main elements:

a) Develop navigation to link elements in the Mobile Learning prototype;
b) Develop the menu;
c) Develop appropriate activities based on student needs; and
d) Develop appropriate learning objects based on student needs.

Implementation & Evaluation Phase

This phase enables the researchers to examine the usability, reliability, functionality, and efficiency of the Mobile Learning prototype. This phase also involves the evaluation of the Mobile Learning prototype using alpha and beta testing.

a) An alpha test is conducted to assess the development carried out by the experts. In this study, these experts should be drawn from the fields of CAD and ICT.
b) A beta test is conducted to assess the development carried out by students or users with capacity and capability commensurate with that of the respondents. In this study, the experts must be students or consumers who are enrolled in CAD courses.

In order to verify the impact of the Mobile Learning prototype on the teaching and learning process, alpha and beta test evaluations will also be performed on each of the following elements:

a) Learning Strategy
b) Prototype
c) Student Performance
d) Navigation
e) Content
f) Problem Solving
g) Information Management

Evaluation Phase

Using quasi-experimental design, this phase highlights and examines how these materials affect the user. The study was designed to evaluate the impact of Mobile Learning on student performance, problem solving, and information management; it also evaluates the effectiveness of the strategies implemented in the prototype on the respondents. Quasi-experimental design was used to identify differences between the impact of collaborative learning strategies and that of independent learning strategies on the performance of students enrolled in CAD courses. The information in this chapter is summarized in Figure 11.1.

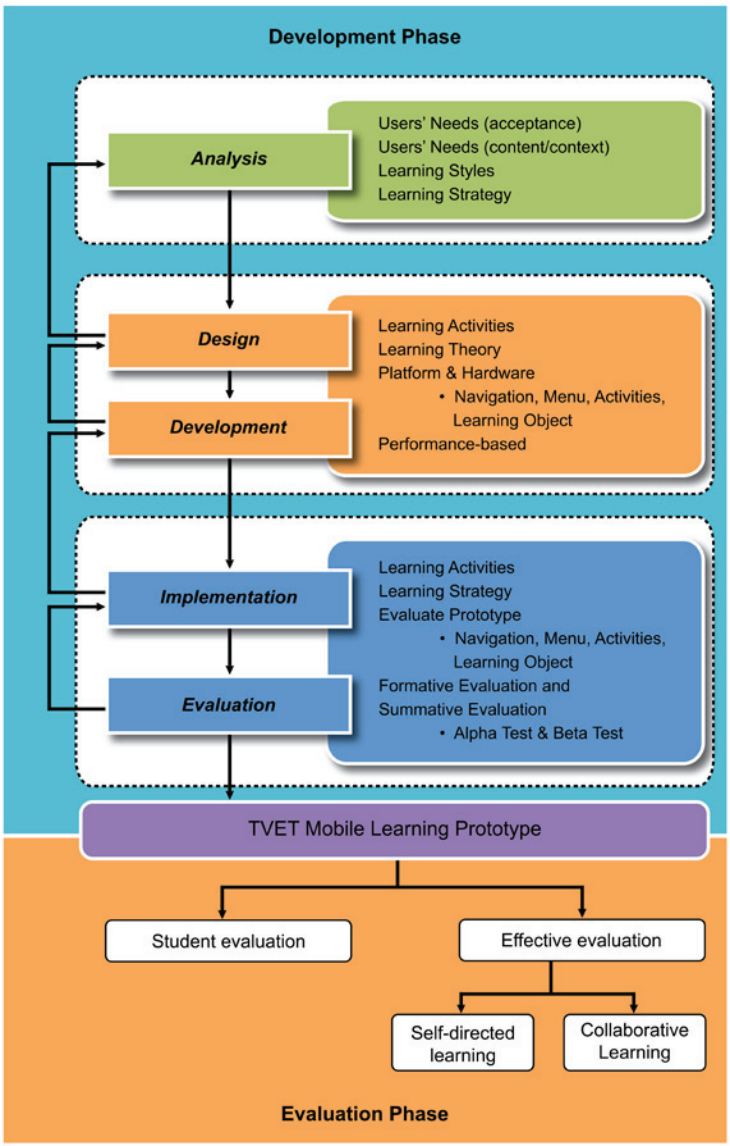

Figure 11.1: Mobile Learning Development and Evaluation Framework for a Performance-based Environment.

Discussion

Based on the findings of the study, the development or evaluation of learning materials requires a detailed framework to guide it, since the process of development or evaluation are affected by the design of the framework. The framework for a Mobile Learning prototype must consider the development model and the model to be adapted in the development phase. In this study, the ADDIE model was found to be suitable and effective for use in the development of the prototype. Furthermore, researchers must use a suitable model and ensure that the learning materials achieve their development target. A performance-based environment will ensure that instructors focus not only on how to convey information but on student performance, as well (Pfeffer & Sutton, 1999).

Furthermore, a performance-based environment which consists of the 3 Cs of Competence, Cost, and Cause and Effect (Gery, 1991) will add value and ensure that meaningful learning takes place. By adapting and incorporating various learning theories while designing the prototype, the designer can significantly improve the learning materials and the purpose and plan of the activities. The use of appropriate learning theories will ensure that all newly designed activities achieve the learning purpose. To determine whether the prototype is effective and has a significant impact on the user, the researchers must plan and decide upon a suitable research design. Quasi-experimental design is most suitable for evaluating the effectiveness of this Mobile Learning prototype. An experimental study is a study conducted to determine the effects of a treatment, as Figure 11.1 illustrates.

Conclusion

The effectiveness and success of this Mobile Learning prototype can be verified only after the actual field test and data collection. Sufficient exploration and planning of the development and evaluation framework will contribute to the smoothness of the research and the accomplishment of the research goal. Careful planning will also help ensure that the learning materials achieve their intended purpose through the integration of technology. The development process should follow the model established by the development phase and should ensure that the prototype is suitable for learners and users. Finally, the prototype must be tested to determine whether, accompanied by the appropriate strategies, it can be used effectively for learning purposes.

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{ Chapter Twelve }

Mobile Pedagogical Agent: A New Approach for Mobile Learning

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Introduction

Mobile Learning, also called m-learning, is the ability to learn anywhere, anytime, facilitated by a range of mobile devices. People to stay in contact via SMS, mobile phones, chatrooms, and email (Frand, 2000; Oblinger, 2003; Rickard & Oblinger, 2003). According to Oblinger (2003), the key traits of today's students are being digitally literate, 'always on', mobile, experimental, and community-oriented. Therefore, implementing a Mobile Learning method among the students is useful because content can be accessed from any location where mobile Internet access exists (Mobile Learning Reviewed, 2009). Dhanarajan (2009) stated that more than one-third of the world's adult population, especially those living in developing countries, has no access to printed information or technology that could improve quality of life. Hence, such disadvantages become major barriers to cost-effective delivery of quality education in developing nations (Valk *et al.,* 2010). Therefore, applying a knowledge-based system to Mobile Learning could be beneficial for students. According to Valk *et al.* (2010), ICT, especially mobile devices, can empower teachers and students by facilitating communication and interaction, offering new modes of delivery and also transforming teaching and learning processes.

Background

'Stay connected', the idea of being in touch any place, any time, is a natural part of life for information-age students (Frand, 2000). The evolution of technology, particularly the influence of the Internet on communication, has made this concept a reality. Therefore, the challenge that educators and designers now have is how to best take advantage of the Internet communication resources to support learning. Collaboration put simply, means working with others. Bruner (1991) stated that 'Collaboration is more than either communication or

coordination. Communication can help people do their jobs better by providing more complete information, but it does not require any joint activity. Coordination involves joint activity, but allows individuals to maintain their own sets of goals, expectations, and responsibilities.' Hence, working collaboratively will result in a higher quality end product than that which results from working alone.

The emergence of Computer Supported Collaborative Learning (CSCL) and Mobile Computer Supported Collaborative Learning (MCSCL) improves the collaborative learning environment tremendously. More flexible approaches to learning and greater use of online tools provide new oppurtunities for student collaboration and teacher support of group work (Pallof & Pratt, 1999).

In order to improve education through technology, the availability of information, tutors, and instructors is imperative. There are systems, such as Intelligent Tutoring Systems (ITSs), which ensure both knowledge acquisition and tutoring. These systems can provide knowledge acquisition while constantly supporting students' needs. Like a human tutor, the ITSs in this study provide a natural language interface for their users.

The main difference between the knowledge-based systems and conventional programs is knowledge acquisition. Typically, knowledge-based systems are formed using an incomplete knowledge database; therefore, additional data must be entered by users.

For the current study, students from Cosmopoint International College of Technology (CiCT), Melaka, learned about the topic of 3D Animation. Thirty students from one CiCT class participated. The topic of 3D Animation was selected because learning the process requires critical and creative thinking. The method of collaborative learning method and ITS were integrated to improve the learning process and students' understanding.

Design & Methodology

Mobile Pedagogical Agent (MPS)

A Ubiquitous Knowledge Acquisition System (UKAS) is an MPA. The learning content for this study was derived by using an MPA that provided answers to the questions students asked. The MPA was used to provide the students with appropriate and refined answers, thereby increasing content access speed. This agent was also used to simulate conversation skills among students.

To encourage students to access the content, they were asked to participate in collaborative work. A Learning Activity Management System (LAMS) was used as a platform to support the MPA in this virtual collaborative learning environment. The instructors posed questions for students using the LAMS and each student had the opportunity to use the MPA as a resource prior to sharing ideas with their peers.

This tool also became a tutor, providing answers to students. Students cannot necessarily rely on their peers for accurate information. However, consistent access to an MPA allows students an alternative research tool. Figures 12.1. and 12.2 illustrate such a scenario.

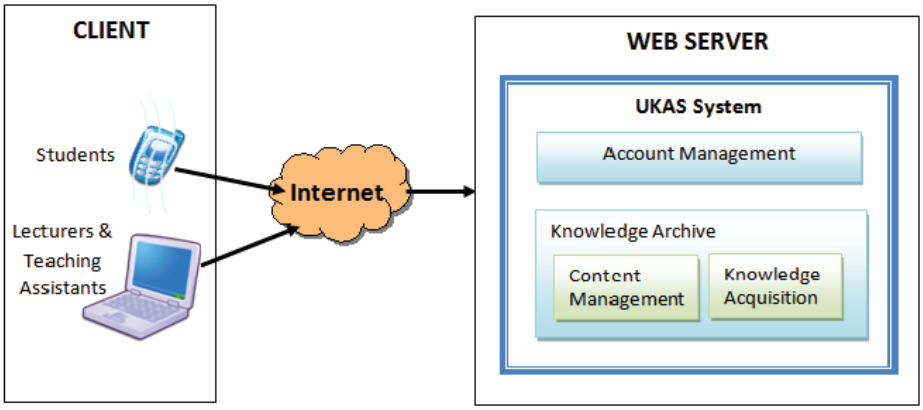

Figure 12.1: Scenario without a Pedagogical Agent

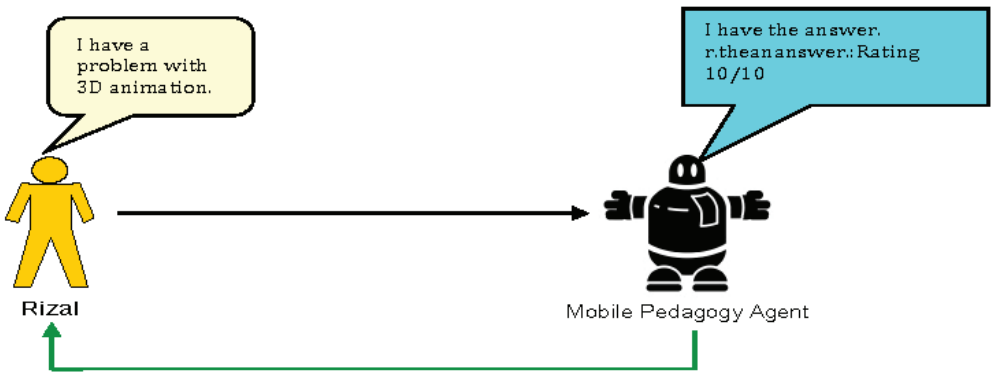

Figure 12.2: Scenario with a Pedagogical Agent

Design of a UKAS

A UKAS is a system that provides open source knowledge. The main idea of the system/ prototype is that it can always be updated with new ideas or data by the users/students.
The content of the Knowledge Archive in a UKAS system is designed as follows:

i) Goal based (Schank & Kass, 1996)
The instructions provide both computer operations and context by providing production samples. From these samples, the students can get the basic idea to develop other productions.

ii) Small steps (Skinner, 1954)

The contents are divided into small steps and indexed. The materials are visibly structured so that they may be easily studied. If the students are beginners, it is necessary for them to follow the instructions step-by-step. More advanced learners can select the contents to study.

The main or initial stage of UKAS has only Introductory Knowledge about 3D animation. At this stage, the students have the opportunity to individually study all the basic areas of information. Then, in the Advanced Knowledge section, the students are given a small task or challenge that applies skills learned in Introductory Knowledge (see Fig. 12.3). This can be done through collaborative work among the students to construct new ideas.

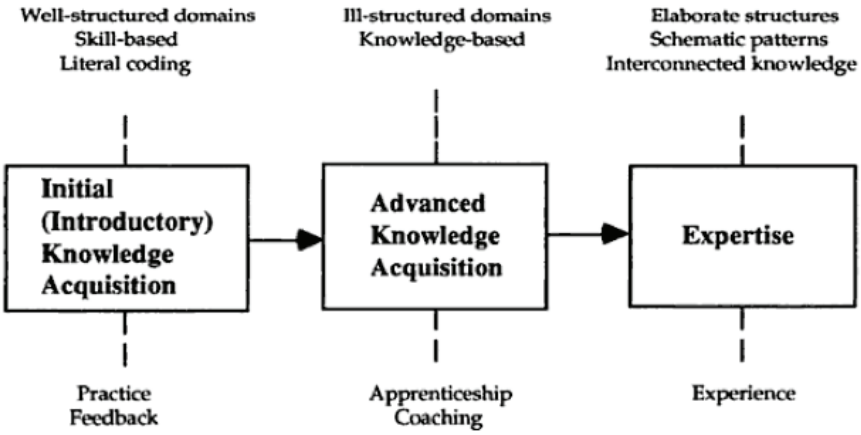

Figure 12.3: Three Stages of Knowledge Acquisition (Jonassen, 1992)

Furthermore, students with scripts argue better and acquire more knowledge on argumentation than students without scripts (Weinberger *et al.,* 2005). At the final stage, the best ideas from the students are selected and added into the Advanced Knowledge domain by Admin.

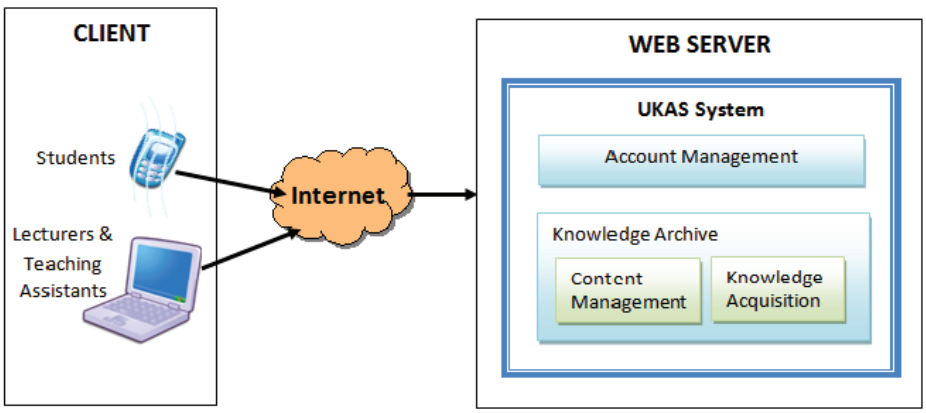

Figure 12.4: Architecture of a UKAS System

Table 12.1 summarizes the functions of each component in the system.

Table 12.1: The Architecture of a UKAS System

Component	Function
Account Management	Record user information. Enable users to create a new account in order to access the system.
Knowledge Archive (Content Management)	Manage and insert the Introductory Knowledge content into the data base by Admin. Update the knowledge content with Advanced Knowledge, contributed by students.
Knowledge Archive (Knowledge Acquisition)	Provide knowledge requested by users.

Major Components of a UKAS

The major components of a UKAS are Account Management, Content Management, and Knowledge Acquisition. Each component serves a different purpose. The Account Management component serves to record the users' data, the Content Management component serves to update and add 3D subject contents into the UKAS, and the Knowledge Acquisition component serves to facilitate users' information acquisition.

i. Account Management Component

A UKAS has two Account Management components: one for the Admin Panel/Instructors and one for students. Both components serve to keep the user records and to authenticate users.

ii. Content Management Component

The 3D subject content is inserted in the Content Management component. It is also referred to as the Admin Panel. Only admin or instructors are able to view, edit, delete or add content. There are six fields that the users can fill title column, sub-title column, content column, recently asked questions column, tag keyword column, and file upload column. The content column has an editor who facilitates management of the proportion of text or graphics. The most important part of a UKAS is the tag keyword column because it is where search queries are addressed. The file upload column is where the user can upload notes or sample 3D Maya files for the students to view.

iii. Knowledge Acquisition Component

The Knowledge Acquisition component is the output design of a UKAS. It is where the students can view the 3D subject content from their laptops or mobile phones. This component is mainly built as a search engine that can provide answers to students' specific queries. There is also a 'predicted queries' option available to refine a user's search. The 'predicted queries' option is captured from the title of the content.

Implementation

In order to implement an MPA, the Jigsaw learning method was chosen as the pedagogical strategy. In a traditional classroom, Jigsaw learning activities are performed in four essential steps: topic assignment, individual study, expert group meeting, and the Jigsaw group meeting. Therefore, the study first considered the method for implementing these four steps in a virtual collaborative learning environment, with the additional step of knowledge acquisition with an MPA by using a LAMS as the learning platform. The UKAS merged the learning sequences created using the LAMS. The LAMS also served as a suitable platform for students to discuss and perform their task.

The procedure is shown in Figure 12.5 which illustrates how the four phases of the Jigsaw method were adopted in this study.

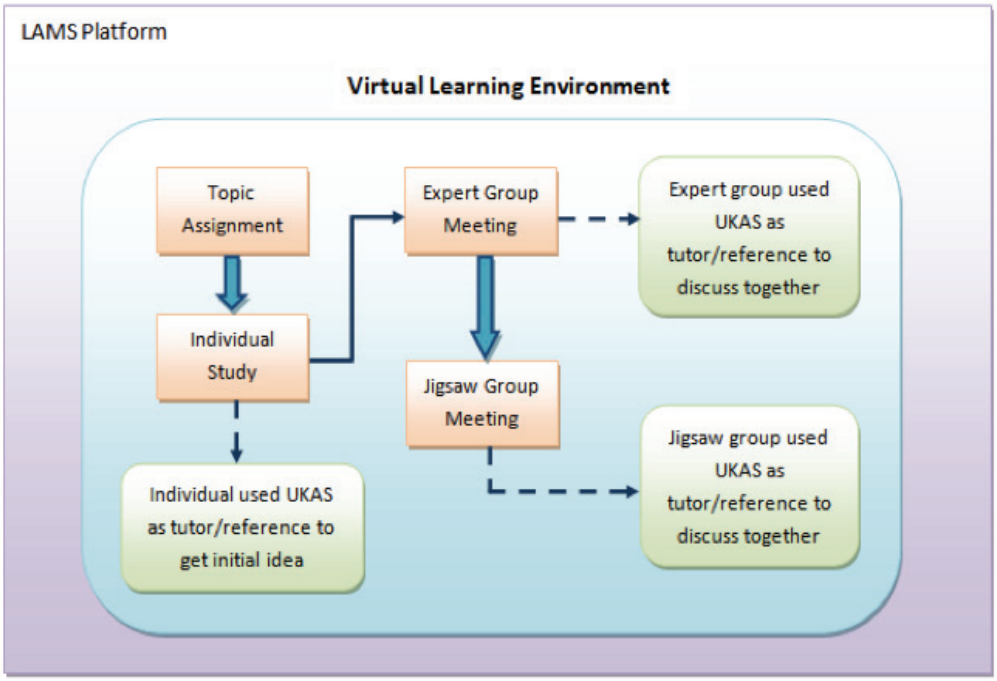

Figure 12.5: The Flowchart of Virtual Jigsaw Learning Activities (Adapted from Huang *et al.,* 2008)

i. Topic Assignment

The course instructor assigned topics to the jigsaw group. For this study, the course chosen was 3D Animation and there was one 3D Project divided into four topic assignments. The topics were posted on the LAMS prior to the students' involvement. In each jigsaw group, each student studied a different topic. In other words, students should be divided into equal groups when using the jigsaw method. If the students cannot be divided into equal groups, two students

may be assigned the same topic. By using the LAMS, the students can identify their group numbers, fellow group members, and the assigned topics.

ii. Individual Study

Initially, during this phase, the students individually studied their assigned topics and submitted their answers. There were two groups of students. One group with an MPA (experimental group) and another group without an MPA (control group). Since the MPA is provided in the LAMS, the students could use it as a resource or tutor for a given task. Students who do not have an MPA could use other available resources. Each student twas required to record ideas in his/her private window at an allocated time.

iii. Expert Group Meeting

At this phase, the students who revised the topic assignment individually met with other students who answered the same topic and held an expert group meeting. Those students who had access to an MPA could then share their resources with other group members to support their presentation. During this time, students could develop a much deeper understanding and extend their knowledge through discussion with other experts. All the discussion was done by using the chat function in the LAMS. At the end of this meeting, all the students were able to finish their topic assignment and submit their individual project file in the LAMS.

iv. Jigsaw Group Meeting

Upon completion of an expert discussion, each expert met with their original jigsaw members to perform a jigsaw group meeting. Here, the jigsaw groups were given a 3D Main Project as an assessment to accomplish. The students had to merge all the skills and knowledge they gained from the topic assessment to develop the 3D Main Project. Here, the same students who had access to an MPA could share their resources with fellow group members and hold a group discussion. At the end of this meeting, all the students were asked to submit their completed answer and project file in the LAMS.

Findings & Discussion

The performance of the experimental group after being exposed to the Jigsaw learning method with an MPA and the performance of the control group after being exposed to the Jigsaw learning method without an MPA were analyzed using their pre-test and post-test results. The difference between the pre-test and post-test results of the experimental and control group is shown in Table 12.2.

Table 12.2: Differences between the pre- and post-test results of the experimental and control group

Respondents	Control Group	Experimental Group
1	2	6
2	4	4
3	6	6
4	4	6
5	4	2
6	4	0
7	4	6
8	2	-2
9	4	6
10	4	2
11	2	6
12	-2	14
13	4	10
14	4	10
15	6	6
Mean	3.467	5.467
Std. Deviation	1.922	4.033

As can be seen in Table 12.2, the mean of the difference between the pre- and post-test results of the control group is 3.467, while for the experimental group, it is 5.467. The standard deviation of the control group is 1.922, while that of the experimental group is 4.033. This data show that the experimental group performed significantly better than the control group. This is further explained in Table 12.3, which presents the independent sample t-test score difference between the experimental and control groups.

Table 12.3: Independent Sample T- Test Score Difference

F		Levene's Test for Equality of Variances		t-test for Equality of Means						
		Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
Test	Equal variances assumed	3.715	.064	-1.734	28	.094	-2.000	1.154	-4.363	.363
	Equal variances not assumed			-1.734	20.049	.098	-2.000	1.154	-4.406	.406

As presented in Table 12.3, the independent sample t-test reveals a significance value of 0.064, which is greater than 0.05. Therefore, it can be assumed that the variances are approximately equal. The sig. (2-Tailed) value is 0.09, which is greater than .05. Therefore, it can be concluded that there is no statistically significant difference between the mean score difference for the control and experimental groups. However, Table 12.2 reveals that the mean for the experimental group is greater than that for the control group. Therefore, it can be concluded that the experimental group performed better than the control group in the post-test.

This finding is consistent with that of Lai and Wu (2006), whose results showed that the experimental group performed better than the control group when using hand held devices. The results are also consistent with those of earlier studies that compared a collaborative learning method with the use of hand held devices as support (Zurita & Nussbaum, 2004b; Zurita & Nussbaum, 2004a). The finding from Zurita and Nussbaum (2004a) also proved that the use of handheld devices mediated interactivity and at the same time encouraged mobility among the students during collaborative work.

Summary

This study discussed the design and architecture of a UKAS, an MPA, and how the prototype was implemented using a jigsaw learning strategy in a virtual collaborative learning environment. The study promotes a new approach for implementing MPAs in a virtual collaborative learning environment in order to improve learning with technology.

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{ Chapter Thirteen }

The Effectiveness of a Web-based Mobile-supported Learning Management System

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Introduction

It is widely believed among scholars that the implementation of collaborative learning in the classroom is able to boost learning performance. Past researchers (Smith & MacGregor, 1992; Soller *et al*., 1998; Yu, 2009) have listed additional positives that make collaborative learning more effective than traditional group learning, such as positive interdependence, social skill, participation, promotive interaction, and group processing.

After investigating past studies on collaborative learning activity, however, we can notice the interesting fact that findings on the use of technology for collaborative learning activity vary. Some studies have shown significant results on students' performance (Beck *et al*., 2005; Burgués *et al*., 2010; Johnson *et al*., 2000; Rao *et al*., 2002; Soh *et al*., 2005; Soh, 2006a), while others have not (Burgués *et al*., 2010; Ke, 2006). From a closer look at these studies, we see that the implementation of collaborative learning seems to bring a positive effect on group academic performance but not on individual performance (Rao *et al*., 2002); when students who have been engaged in collaborative activity are tested individually, they have lower scores than students engaged in traditional learning activity (Hanze & Berger, 2007). Questions arise due to this phenomenon. If collaborative activity is able to improve students' attitudes and interest when they are considered as a group, why does it not lead to improved individual academic performance?

At this point, it is important to differentiate between collaborative learning and cooperative learning. Cooperative learning is a sub-approach under the umbrella of collaborative learning (Smith & MacGregor, 1992), but with a different goal. Collaborative learning involves knowledge construction and problem-solving through conversation, where the teacher acts as a facilitator, while cooperative learning is concerned with individual learning, with the teacher acting as a director to stimulate social skills, interdependence, cooperation, and accountability. Although it is important to differentiate between collaborative and cooperative learning,

because these terms are often used interchangeably, in practice the implementation of group learning should take account of both group and individual performance.

Based on the distinction above, it is clear that under a collaborative learning approach, individual performance is not the main concern; hence, individual performance will not be higher than under traditional learning. This is the first reason why collaborative learning is not as effective as has been hoped, and is the first problem for the present research. We have seen that cooperative learning is concerned with individual performance. However, it has only an indirect effect on individual performance, which is the second problem for this research. It seems that cooperative learning directly affects students' learning experiences, via their learning involvement, motivation, and interest, but does not directly affect their individual performance. The third problem taken up in the present paper is the diversity of students' needs and their unequal learning ability(Hai, 2005; Mat Zin, 2006; Sabeh *et al.*, 2011). Both collaborative and cooperative learning are only viable teaching approaches if students feel comfortable in the collaborative and/or cooperative environment and their learning potential is fully utilised, which may not always be the case.

The development of technology brings positive impacts on learning. The proliferation of web-based and mobile instruction media can allow learners to learn by enabling a bi-directional flow of information at any pace, time, and place (Jolliffe *et al.*, 2003). Web-based learning (WBL) also supports other tasks related to communication, assessment, classroom management, and learning activities (Jolliffe *et al.*, 2003). The implementation of WBL is related to the approach to and design of classroom instruction (Clark, 2003). When a poorly designed pedagogical approach is translated into WBL, it will become a poor web-based approach (and vice versa).

Learning Management Systems (LMSs) have been implemented by educational institutions worldwide to centralise and manage learning resources, educational services, learning activities, and institutional information. An LMS can be defined as a server-based software package used to manage and deliver instruction and track and manage learner data, and some LMSs may also provide authoring tools and serve as a repository for content (Berking & Gallagher, 2011).

Design & Methodology

The present study proposes a model intended to support maximum performance in cooperative, technology-supported learning. Five hypotheses were developed, but not all elements of these hypotheses were tested, since this study focuses on the effects of learning style and cognitive style on learning when engaging in a cooperative learning activity. Future research to evaluate other elements within the model should therefore be done. Web-based learning was chosen as a learning vehicle, since it offers advantages such as flexibility, distribution of resources, interactivity, and self-learning. Four learning environments (LEs) were created, as seen in Figure 13.1: Theoretical Framework: (1) one that ignores learning style but considers cognitive style (MOF), (2) one that considers both learning style and cognitive style (AF), (3) one that ignores both learning style and cognitive style (MONF), and (4) one that considers learning style but ignores cognitive style (ANF).

Next, an experiment was conducted to evaluate the effectiveness of the proposed model on learning performance. The experiments were conducted over four weeks among engineering

students at Universiti Teknikal Malaysia Melaka, in Malacca. Each week, students were exposed to a different LE and their learning performance was assessed. The experiment gathered and analysed quantitative data, and teachers and students were the actors in the learning activity. Actors interact with tasks and learning content through learning tools. Five components to the learning tools exist that are used by teachers to create activities and interactive learning content and perform learning assessment, and by students as a user interface that presents the content they are to cover and the tasks or activities they should do.

Web-based learning also offers client–server application and provides flexibility as well as a resource repository. Burgués *et al.* (2010) and Soh (2006) state the advantages of remote educational tools as follows: (1) they help the teacher evaluate student progress by automatically grading tests and quizzes, (2) they support flexible learning (since students can use the tool anytime, anywhere), (3) they help teachers implement interactive learning, (4) they support self-learning (since they can provide feedback on students' answers), (5) they increase learning achievement, (6) they can make questions that require a deeper understanding of material and demand a richer response from students, (7) they can track student activity and provide information on it to teachers, and (8) they can include collaborative features such as chat rooms or a digital whiteboard.

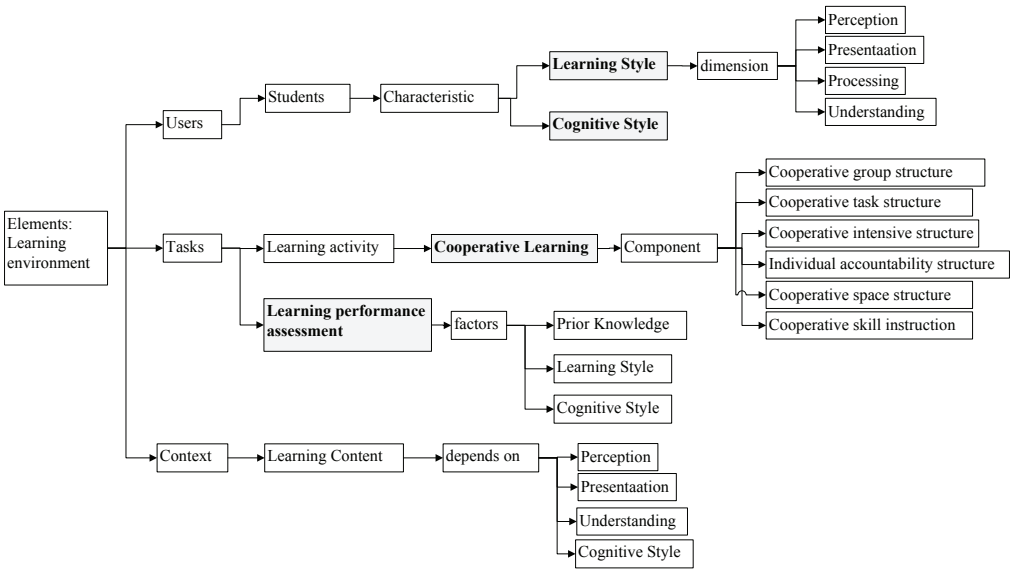

Figure 13.1: Theoretical Framework

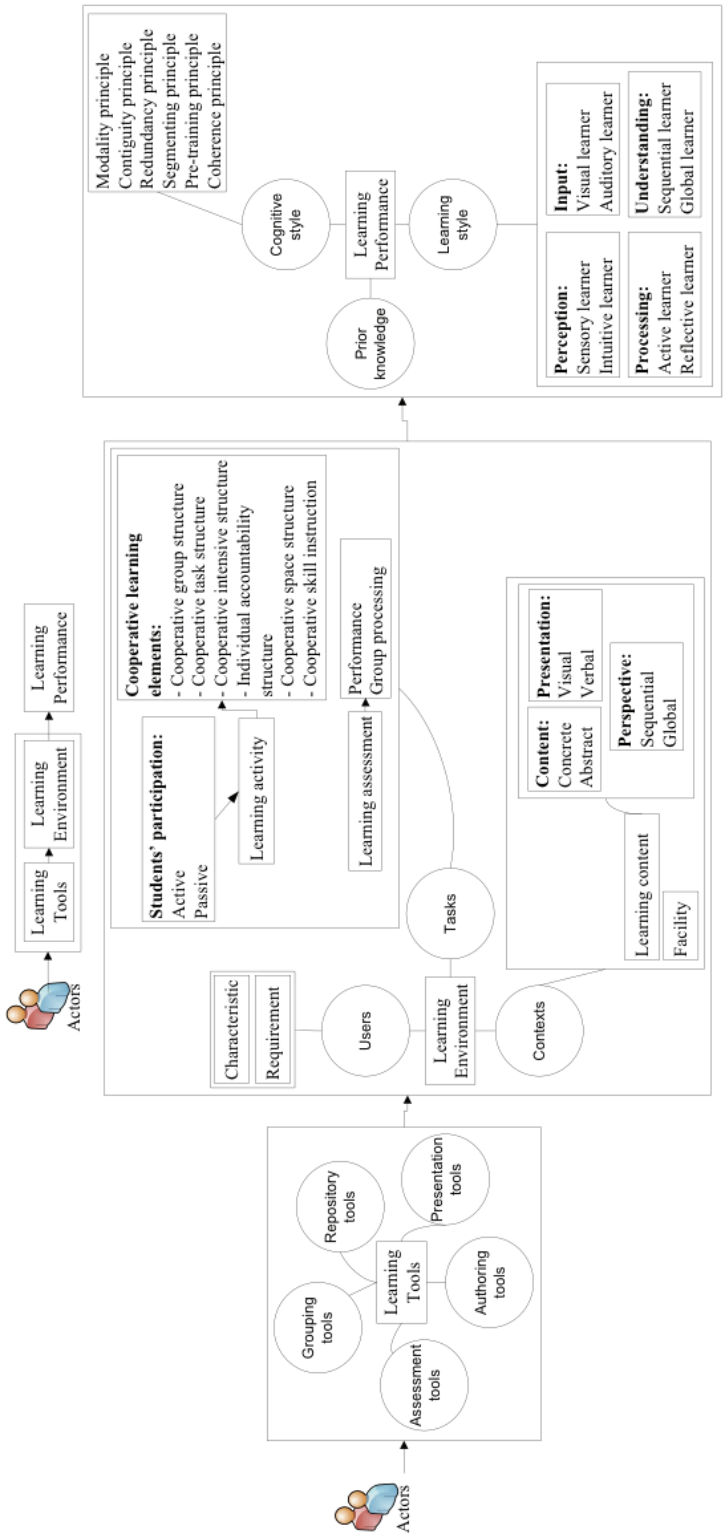

Figure 13.2: Learning Model

As its LMS, this study used Moodle (version 1.9), because it has the functionality to implement the learning tools in the proposed model and because it allows users to assess content online and offline using Mobile Learning Engine (MLE). Four learning environments (LE) were created to present learning environment differently based on learning style and cognitive style, as seen in Figure 13.2 and discussed in the previous section. Tools provided include authoring, assessment, grouping, presentation, and repository tools. The ADDIE (analysis, design, development, implementation, and evaluation) approach was implemented in the development process, as illustrated in Figure 13.4.

Moodle was installed in a web server pre-installed with PHP and Apache. Before installation, an empty database needed to be created to store information such as hostname, name, username, and password. As seen in Figure 13.3 Moodle supports functions called 'label', 'text page', 'web page', 'link to file or website', 'folder', and 'IMS content package'.'Label' is used to group resources or activities by labelling them. A text page displays resources in the form of text only, while a web page has additional interactivity, multimedia, and the ability to direct the learner to resources elsewhere on the Web.

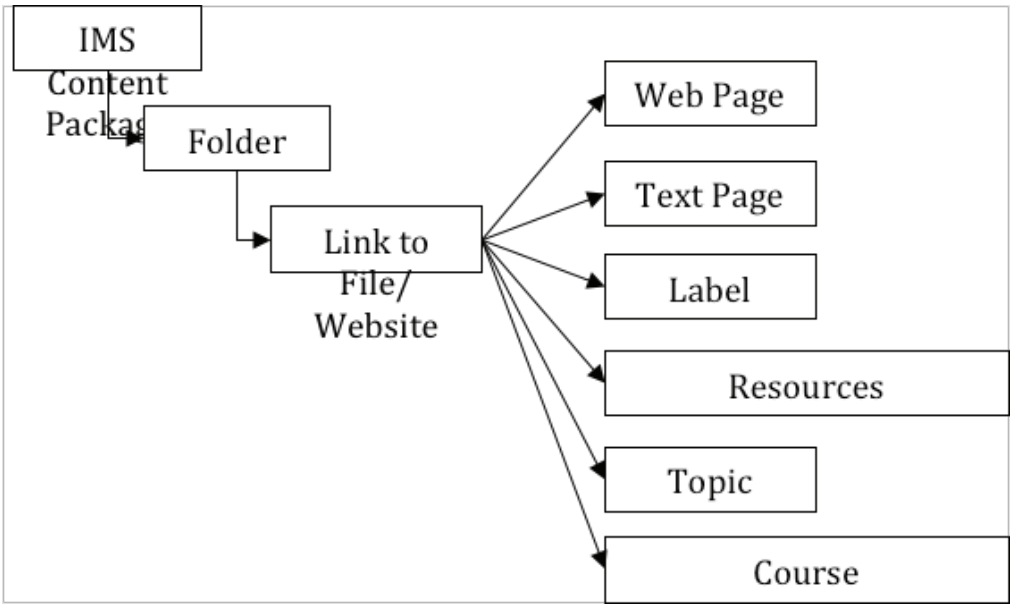

Figure 13.3: Content Resources

Moodle offers both individual and group learning tools. The activities offered, as seen in Figure 13.5 are 'chat', 'assignment', 'forum', 'quiz', and others. Further activities can be downloaded or created based on needs.

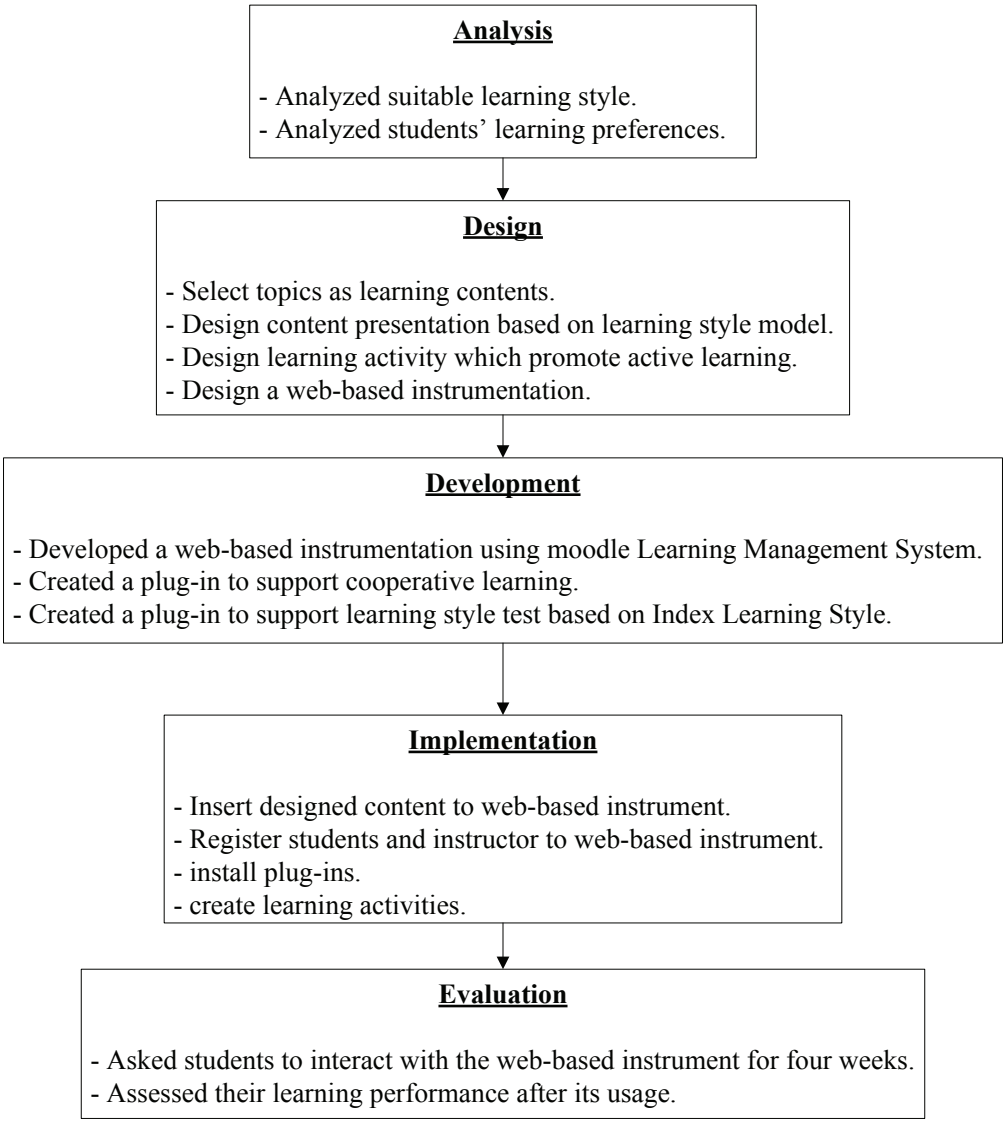

Figure 13.4: ADDIE

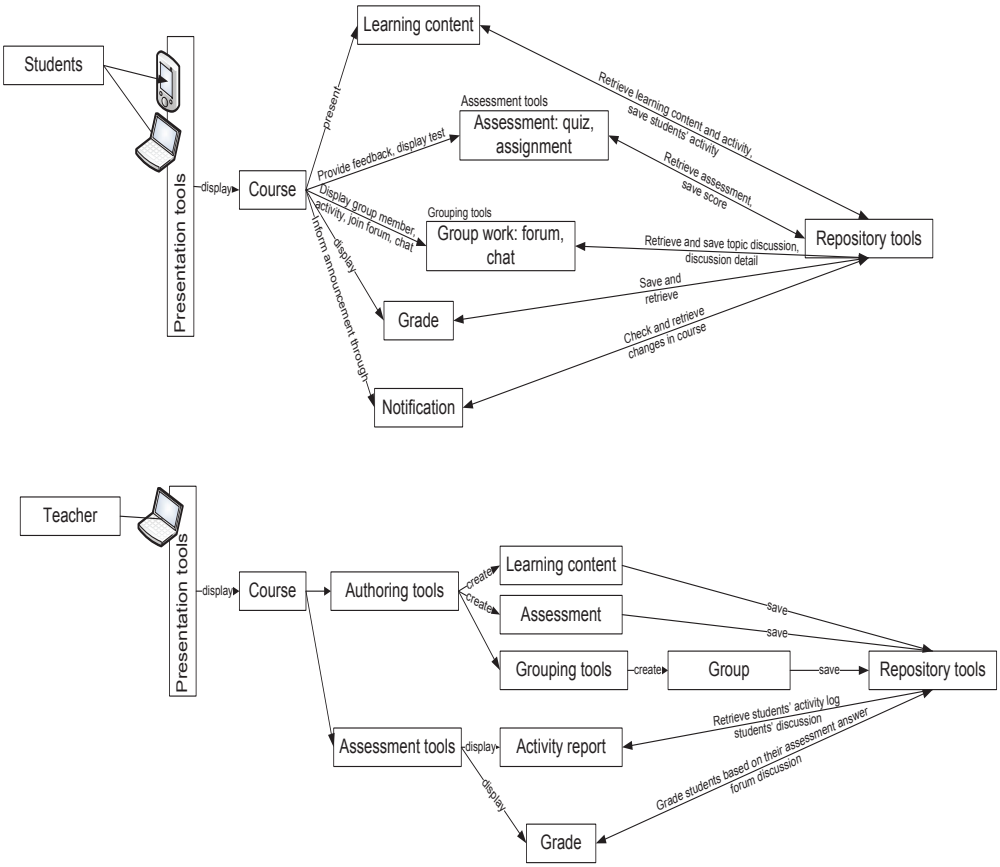

Figure 13.5: System Architecture

Findings & Discussion

Participants were asked to use the web-based instrument for four weeks in order to make possible the assessment of their learning performance. Each week, students' prior knowledge was tested using PKT and post-activity result were collected using LAT, as seen in Figure 13.6. By the end of the experiment, the following information was obtained: (1) students' prior knowledge on all topics was equal, (2) the effect of learning style on LAT score, (3) the effect of cognitive style on LAT score, (4) students' performance in a less preferred learning environment, and (5) students' learning performance was best when they learned in an environment which considered cognitive style and learning style.

In order to validate the LAT scores, a PKT test was conducted to determine whether students had the same level of knowledge before and after the treatment. The results of descriptive analysis show no outliers; hence, the PKT scores were equal across the four different learning environments.

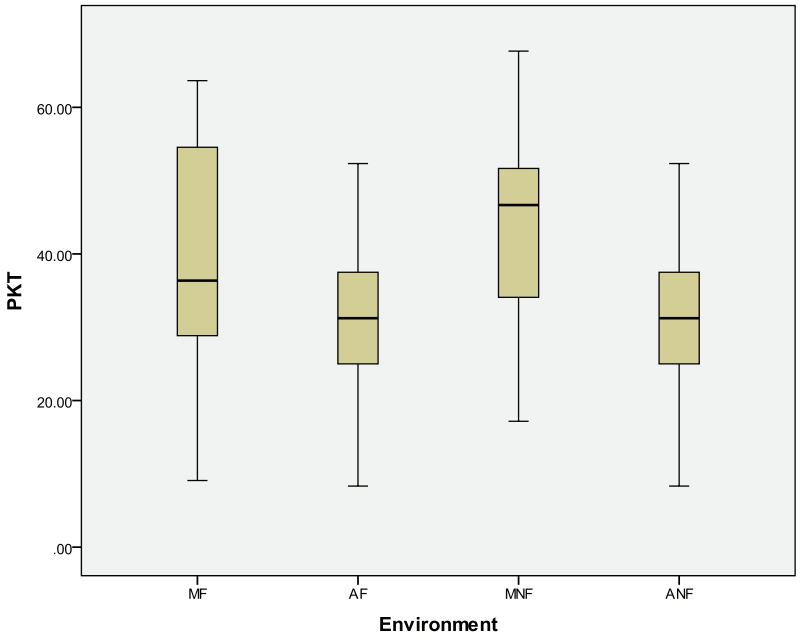

Figure 13.6: PKT Scores in Four Learning Environments

Since all students had the same level of knowledge of the learning material before treatment, it can be said that prior knowledge which had the potential to affect students' performance was controlled.

The data was separated into two groups: a control group (ignoring learning style: M) and an experimental group (considering learning style: A). In the control group environment, consideration was given to reflective activity, abstract content, verbal presentation, and sequential perspective, as in traditional learning activity. In the experimental group, these items were further differentiated: participants were given an environment in which content and activity were balanced between complementary dimensions, such as active and reflective activity, abstract and concrete content, visual and verbal presentation, and global and sequential perspective. In this study, 47 participants were asked to interact with two learning environments each: the control and one experimental group. PKT was conducted before the treatment and LAT after the treatment. An independent-sample t-test was conducted to compare total LAT scores between learning environments M and A. From the result analysis, we find that Levene's Test shows a significant difference (.000; $p<.05$), which means that variance between A and M is not equal. This may be due to the study's within-subject design, where the same participants were asked to interact with different learning environments to keep the sample size equal.

The significance threshold is p=.00, less than the level of .05, and therefore there is a significant difference in LAT scores ($t(174.60)=6.51$, $p=.00$) for environment M (M=79.70, SD=8.21) and A (M=88.74, SD=10.67). The magnitude of difference in the means is eta squared = .44m which means that 44% of variance in students' performance is explained by learning environment in relation to learning style. The positive, significant data indicates that the implementation of a particular learning style brings effects on students' performance; on

average, LAT score is better when students learn in an environment that considers learning style (M=88.74) than in one that ignores it (M=79.70).

An independent-sample t-test was conducted to compare LAT scores between learning environments M and A. The significance threshold for Levene's test in this study is .036 (p<.05) which indicates that the variance between M and A is not equal. From the result, the value of p=.00 is less than .05, indicating a positive effect of consideration of learning style. This difference was significant (t(185.04)=4.98, p=.00) and the effect is mediumsized, r =.34. On average, LAT score is higher in environment A (M=86.00, SD=11.90) than in M (M=77.66, SD=11.07). Therefore, the null hypothesis was rejected, and it is concluded that the implementation of a learning style brings effects on performance and successfully improved the evaluation by experts in an environment which considers learning style. An independent-sample t-test was conducted to compare LAT scores of tutored students between learning environments M and A. Levene's Test shows significance(.164; p<.05), which means variance between A and M is equal.

From the result, it can be seen that there was a significant difference in LAT scores (t(186)=4.25, p=.00 or$p$<.05) for environments M (M=77.13, SD=22.51) and A (M=88.36, SD=12.25). This indicates that student performance in an environment which considers learning style (M=88.36) is higher than in one which ignores it (M=77.13). The magnitude of the difference in the means was moderate (eta squared=.30), and illustrates that the intervention successfully improves the performance of 30% of tutored students. Therefore, the null hypothesis was rejected, and it was concluded that the implementation of a learning style improves the performance of 30% of students. When looking at the data by group, we see that in the control group environment (NF), participants were given content which ignored cognitive style, whereas in the experimental group, participants were presented with content that considered cognitive style.

Levene's test results show a significance of p=.000 (<.05) which indicates that the variance between NF and F is not equal, and there is a positive, significant effect of cognitive style on students' performance. This difference was significant (t(169.98)=2.59, p=.01) and represents a small-sized effect, r=.19, which means that 19% of variance in student performance is explained by cognitive style. On average, participants' LAT score is higher in an environment which considers cognitive style (M=86.17, SD=11.85) than in one which does not (M=82.26, SD=8.63).

An independent-sample t-test was conducted to compare expert LAT scores between learning environments NF and F. Levene's Test shows a significant value (.164; p<.05), which means variance between A and M is equal. There was no significant difference in LAT scores for expert evaluation (t(186)=.038, p=.97) for environments NF (M=81.86, SD=12.78) and F (M=81.80, SD=11.67). This non-significant result indicates that cognitive-style implementation did not affect students' expert learning performance.

Finally, an independent sample t-test was conducted to compare tutored LAT scores between learning environments NF and F. Levene's Test shows significance(t(.113; p<.05), which means variance between NF and F are equal. There was a significant difference in LAT scores for tutored evaluation (t(186)=3.93, p=.00) between environments NF (M=77.52, SD=22.70) and F (M=87.97, SD=12.25). On average, students' tutored performance was higher when they learned in an environment which considered cognitive style, F (M=87.97) compared to when

they learned in NF, which did not (M=77.52). The magnitude of the difference was medium (eta squared=.28), indicating that the implementation of a cognitive style in a learning environment successfully improved 28% of students' tutored performance.

Conclusion

This research documented the design and development of a learning model for a web- and mobile-based learning instrument which focused on learners' characteristics and needs as well as learning activities and learning facilities to help students achieve better learning performance. Besides, a learning-environment research framework based on learning-style theory and a cognitive processing model was proposed, and a web- and mobile-based prototype was developed based on the proposed model, including learning-material and activity development. A Moodle LMS was proposed because it is cheap, open source, and customizable (for example, convertible from an e-tool to an m-tool). The reviews, proposed learning model, prototype, framework, and findings of this study provide broad theoretical and instructional-design implications.

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